73® Amateur Radio Today

NOVEMBER 1998
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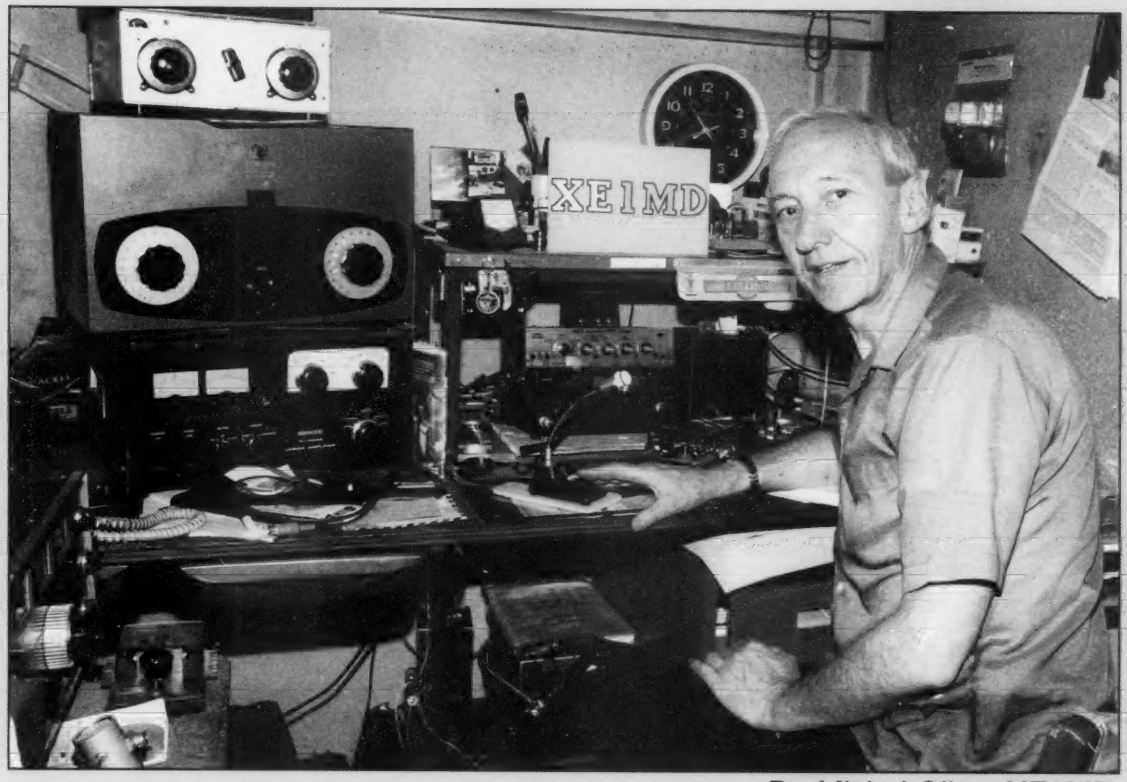


Dr. Michel Oliver XE1MD

Build a:

- Rx Antenna Booster
- VHF/UHF Signal Source
- Tiny Fox Hunt Xmtr
- Capacitor Tester

Review:

- Hamtronics R301 2m Rx — a dilly!

**********5-DIGIT 48103
#0000191981MR9# JUN76
UNIV MICROFILM
SERIAL PRCNG ATTNL
300 N ZEEB RD
ANN ARBOR MI 48103-1553

11>
0 74851 08725 1

Get more features for your dollar with our

REP-200 REPEATER

A microprocessor-controlled repeater with full auto-patch and many versatile dtmf remote control features at less than you might pay for a bare bones repeater or controller alone!

- ***kit still only $1095***
- ***factory assembled still only $1295***

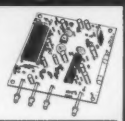
50-54, 143-174, 213-233, 420-475 MHz. (902-928 MHz slightly higher.)
☛ **FCC type accepted** for commercial service in 150 & 450 MHz bands.

Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements!** .....**only $100.**

REP-200C Economy Repeater. Real-voice ID, no dtmf or autopatch. ..... Kit only $795, w&t $1195.

REP-200N Repeater. Without controller so you can use your own. .....**Kit only $695, w&t $995.**

You'll KICK Yourself
If You Build a Repeater
Without Checking Out Our Catalog First!



Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.

COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer. ..... **only $49/kit, $79 w/t.**

CWID. Traditional diode matrix ID'er. ..... **kit only $59.**

CWID-2. Eprom-controlled ID'er. ..... **only $54/kit, $79 w/t.**

DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. .....**$59/kit, $99 w/t.**

COR-4. Complete COR and CWID all on one board. ID in eprom. Low power CMOS. ..... **only $99/kit, $149 w/t.**

COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. .....**kit only $99, w/t only $149.**

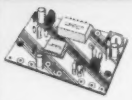
COR-5. µP controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. .....**$379 w/t.**

AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. .....**kit $89.**

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. .....**kit $79.**

TD-4. DTMF controller as above except one on-off function and no toll call restrictor. Can also use for selective calling; mute speaker until someone pages you. .....**kit $49.**

SUBAUDIBLE TONE ENCODER/DECODER

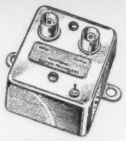


Access all your favorite closed repeaters!

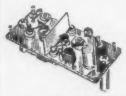
- **Encodes** all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- Comprehensive manual also shows how you can set up a front panel switch to select tones for several repeaters.
- Decoder can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying buzz in receiver. ☺ **New low prices!**
- TD-5 CTCSS Encoder/Decoder Kit .....now only **$29**
- TD-5 CTCSS Encoder/Decoder Wired/tested **$49**

LOW NOISE RECEIVER PREAMPS

LNG-( ) GaAs FET PREAMP
STILL ONLY $59, wired/tested



- Make your friends sick with envy! Work stations they don't even know are there.
- Install one at the antenna and overcome coax losses.
- *Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.*



LNW-( ) ECONOMY PREAMP
ONLY $24/kit

- Miniature MOSFET Preamp
- Solder terminals allow easy connection inside radios.
- *Available for 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, and 400-500 MHz bands.*

TRANSMITTING & RECEIVING CONVERTERS

No need to spend thousands on new transceivers for each band!

- Convert vhf and uhf signals to & from 10M.
- Even if you don't have a 10M rig, you can pick up very good used xmtrs & rcvrs for next to nothing.
- Receiving converters (shown above) available for various segments of 6M, 2M, 220, and 432 MHz.
- Rcvg Conv Kits from $49, wired/tested units only $99.

- Transmitting converters for 2M, 432 MHz.
- Kits only $89 vhf or $99 uhf.
- Power amplifiers up to 50W output.

WEATHER ALERT RECEIVER

A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts. Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!

Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; **all 7 channels** (162.40 to 162.55).

Buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. Also available factory wired and tested.

RWX Rcvr **kit**, PCB only $79
RWX Rcvr **kit with cabinet, speaker, & AC adapter** $99
RWX Rcvr **wired/tested in cabinet with speaker & adapter** $139

WEATHER FAX RECEIVER

Join the fun. Get striking images directly from the weather satellites!

A very sensitive wideband fm receiver **optimized for NOAA** APT & Russian Meteor **weather fax** on the 137MHz band.

Designed from the start for optimum satellite reception; not just an off-the-shelf scanner with a shorted-out IF filter!

Covers all 5 satellite channels. Scanner circuit & recorder control allow you to automatically capture signals as satellites pass overhead, even while away from home.

- R139 Receiver Kit less case $159
- R139 Receiver Kit with case and AC power adapter $189
- R139 Receiver w/t in case with AC power adapter ...$239
- Internal PC Demodulator Board & Imaging Software $289
- Turnstile Antenna $119
- Weather Satellite Handbook $20

SYNTHESIZED FM EXCITER & RECEIVER MODULES

NEW **We recently introduced new vhf fm exciters and receivers which do not require channel crystals. NOW... uhf modules are also available!**

Exciters and Receivers provide high quality nbfm and fsk operation. Features include:

- ***Dip switch frequency selection.***
- ***Exceptional modulation for voice and ctcss.***
- ***Very low noise synthesizer for repeater service.***
- ***Direct fm for data up to 9600 baud.***
- ***TCXO for tight frequency accuracy in wide range of environmental conditions.***
- ***Next day shipping. No wait for crystals.***

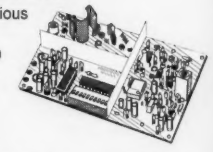
EXCITERS:

Rated for continuous duty, 2-3W output.

T301 VHF Exciter: for various bands 139-174MHz*, 216-226 MHz.

- Kit (ham bands only) ...**$109** (TCXO option $40)
- Wired/tested, incl TCXO...**$189**

T304 UHF Exciter: various bands 400-470 MHz*.



- Kit (440-450 ham band only) incl TCXO ...**$149**
- Wired/tested...**$189**

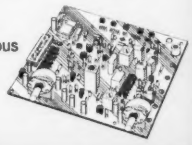
* for gov't & export use.

RECEIVERS:

R301 VHF Receiver: various bands 139-174MHz*, 216-226 MHz.

- **Kit** (ham bands only) ...**only $139** (TCXO option $40)
- **Wired/tested** ...**$209** (includes TCXO)

R304 UHF Receiver: various bands 400-470 MHz*.



- Kit (440-450 ham band only) incl TCXO ...**$179**
- Wired/tested...**$209**

TRADITIONAL CRYSTAL-CONTROLLED VHF & UHF FM EXCITERS & RECEIVERS

FM EXCITERS: 2W output, continuous duty.

- TA51: for 6M, 2M, 220 MHz ..... **kit $99, w/t $169**
- TA451: for 420-475 MHz. ..... **kit $99, w/t $169**
- TA901: for 902-928 MHz, (0.5W out) ..... **w/t $169**

VHF & UHF POWER AMPLIFIERS.
Output levels from 10W to 100W.....**Starting at $99**

FM RECEIVERS:
Very sensitive – 0.15µV. **Superb selectivity,** >100 dB down at ±12 kHz, best available anywhere, flutter-proof squelch. For 46-54, 72-76, 140-175, or 216-225 MHz. ... **kit $129, w/t $189**

- R144 RCVR. Like R100, for 2M, with helical resonator in front end..... **kit $159, w/t $219**
- R451 FM RCVR, for 420-475 MHz. Similar to R100 above. kit $129, w/t $189.
- R901 FM RCVR, 902-928MHz ..... **$159, w/t $219**

WWV RECEIVER

Get time & frequency checks without buying multiband hf rcvr. Hear solar activity reports affecting radio propagation. **Very sensitive and selective** crystal controlled superhet, dedicated to listening to WWV on 10 MHz. Performance rivals the most expensive rcvrs.

- RWWV Rcvr kit, PCB only $59
- RWWV Rcvr kit with cabt, spkr, & 12Vdc adapter $89
- RWWV Rcvr w/t in cabt with spkr & adapter $129

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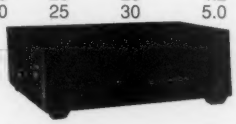
SWITCHING POWER SUPPLIES

	CONT.	ICS	WT.(LBS)
SS-10	7	10	3.2
SS-12	10	12	3.4
SS-18	15	18	3.6
SS-25	20	25	4.2
SS-30	25	30	5.0



SS-25M With volt & amp meters
SS-30M With volt & amp meters

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

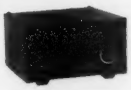
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

• LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅞ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅞ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

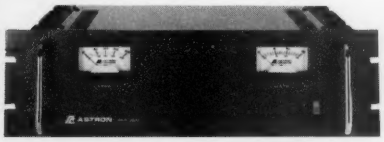
RS-L SERIES



• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

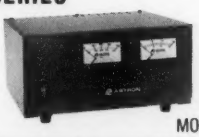
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
VS-70M	67	34	16	70	6 x 13¾ x 12⅛	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅞ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

Dual Bands Now Go More Places

With one touch, switch between 2 meters & 440MHz

Comes with the HM-98 full function, full control mic.

Car dashboards seem to keep getting smaller. Where are you going to fit that big ol' mobile rig? Get a new ICOM IC-207H dual bander (2 meter /440 MHz). Its ultra small, detachable control panel will fit just about anywhere, including your budget!

IC-207H

2M/440MHZ
ULTRA SMALL
DETACHABLE FRONT PANEL*

Dual Bander

at a single bander price!

ONE-TOUCH BAND SELECTION

- Tx: 144-148 MHz, 440-450 MHz
- Wide Band Rx: (includes Airband): 118-174 MHz, 440-450 MHz
- 45 W VHF (2M), 35 W UHF (440 MHz)
- 4 Power Settings per Band
- CTCSS Encode/Decode–Standard
- Built-In Duplexer

9600 BPS PACKET READY

A 6-pin connection point on the back panel is provided for packet operation

- 162 Memory Channels
- Auto Repeater Function
- Full Function HM-98 Microphone– *Control all radio functions, right in your hand. You can even use this mic to program the radio!*
- Optional HM-90 Infrared Wireless Microphone *for cable-free operation*

Big dials, big keys and a big, bright display make for easy operations, day or night!

PC Ready!

Use a PC to download up to 160 frequencies into the IC-207H. It's a fun, useful tool for trip planning!

ICOM options required for PC cloning:
CS-207 Cloning Software
OPC-646 Cloning Cable
A third party 6-pin serial cable is required for PC packet connection

SMALL SIZE, BIG VALUE

Front Panel Dimensions: 4 11/32(w) x 1 17/32(h) x 1 1/16(d). Mount it anywhere! ICOM's Next Generation technology keeps the IC-207H's performance and reliability running high while keeping the price affordable for today's ham.

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On the cover: Dr. Michel Oliver XE1MD is a retired medical doctor who emigrated from France to Mexico in 1962. He is author of *El Arte del DX*. Photo by WB2AQC. Article begins on page 34.

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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NEVER SAY DIE

Wayne Green W2NSD/1

Incentive Licensing

What a crock! The whole idea that different license classes are going to get amateurs to increase their skills is ludicrous. Proven so by experience! Our license exams are no more than exercises in memorization. We go through the ARRL Q&A manual, we memorize, and we pass the tests. It has little to do with understanding any of the concepts involved in electronics and radio or antenna theory. The whole basis for the different license classes is based on a house of cards.

If you have any technical smarts at all you can quickly detect their lack in 99% of the people you contact on the air. I see it reflected in 99% of the mail I get. This may, at one time, have been a technical hobby, but it hasn't been for quite a few years. It's now a hobby where a few thousand old white men have invested a couple thousand dollars in a rig and antenna and sit there flapping their aging jaws until they die of malnutrition (bad nutrition). If the rig stops working it goes back for factory service.

The recent ARRL proposal to simplify our licensing structure is a mile short of hitting the nail. Let's stop all this baloney and call a spade a digging instrument or a card suit. We only need one class of license. We don't need Novice, Tech, General, Advanced, and Extra. We don't need to go back 50 years to Class A, B, and C either.

The true incentive for us to learn lies in the promotion of different modes of communication. You don't get on packet without learning a lot. Ditto RTTY, slow scan and so on. That's the incentive it takes to build our skills, not a memorized test. Hey, it's *fun* to learn. It's exciting to get involved with satellite communications, and once you do you'll learn infinitely more than you will from any Q&A manual.

It's a ball to put together a couple of simple 10 GHz transceivers and take them to mountaintops and start making contacts. WA1KPS and I did this and had a time neither of us will ever forget. Like the time Chuck climbed a tree on the highest hill in Rhode Island and hauled his little rig up there, complete with a three-foot dish. Aiming his dish at my mountain in New Hampshire wasn't easy up there in the tree branches, using the other hand to keep in touch with me on two meters while I tuned for his signal from the top of 3,166-foot Mt. Monadnock in New Hampshire, where I'd climbed with the other rig and a similar dish. We made the contact 5-9+ solid before a farmer with a shotgun chased Chuck out of the tree. We went on to make 10 GHz contacts with all the New England states and New York, all with a tenth of a watt — with one contact over 100 miles and all over 50.

Forcing us to memorize Q&A manuals doesn't build any skills. We build our skills by doing.

The whole concept of incentive licensing is a hoax. It's a scam the ARRL has rammed down our throats and it's helping to kill the hobby. Unfortunately, with your voting cooperation, the League directors are dominated by a little group of old men (white) who seem more interested in protecting their privileges than in preserving the hobby.

When the ARRL first proposed incentive licensing in 1963, it almost killed the hobby. It was submitting their incentive licensing proposal to the FCC in 1963 that killed off within two years over 85% of our ham stores and about 95% of our ham industry. It also led to the stopping of our growth, which had been a steady 11% a year for the previous 17 years. We went into a negative growth period which was only stopped by the introduction of 2m FM and repeaters in 1970. After that we had a growth rate around 1% until the no-code license was introduced.

The worst damage of all was the almost total destruction of the school radio clubs the incentive licensing proposal caused. These had been the main entry route into the hobby, so when they were killed off we lost the infrastructure that had introduced kids to hamming. Before this proposal an ARRL study showed that 80% of all new licensees were teenagers, with 50% being either 14 or 15 years old. Today we're seeing youngsters being about 12% of the newcomers. Can we ever replace this resource? Not without a massive effort. It isn't easy to regrow a destroyed infrastructure. But without thousands of school radio clubs, the future for the hobby looks bleak.

I was 14 when I got interested in amateur radio. I joined the school club (W2ANU) and they helped me with the code. The club had been active since the 1920s and had around 50 members when I was there. It blew away in 1964.

Incentive licensing is a bummer and is killing the hobby, with no perceivable benefits — other than the sale of ARRL Q&A manuals. Let's dump it and have one license. Now, get busy and let the FCC know how you feel.

Code Preservation

A clipping from Clark Smith KE4OZN out of *Popular Science* showed a new Army communications system for battlefield use which provides a secure communication system capable of moving 1.2 gigabytes per second. Hmm, that's about the same throughput of information as 83,916,000 hams could provide per minute at 13-per. Obviously we're going to need a whole lot more hams if we're going to keep up with military technology. Please keep after the ARRL to provide a program that will give us at least 100 million hams so we won't get left so far behind.

Now It's Cough Syrup!

Most cough syrups contain dextromethorphan. A recent study has shown that even after just one dose of this powerful stuff it can cause miscarriages and birth defects. Researchers recommend that pregnant women should avoid all cough medicines and that syrups that contain this stuff be avoided. It's also bad news for people with asthma, a chronic cough, or liver disease.

What they're saying is that cough syrup is bad news. Period.

Adverse Drug Reactions

Researchers have found that more than 100,000 deaths are caused every year in the US from adverse drug reactions. This makes them the fourth biggest killer, after heart disease, cancer and stroke. And this doesn't count deaths due to overdoses and hospital errors. 5% of all hospital admissions are caused by drug

reactions, and once there, 15% of the patients have their stay prolonged by a drug reaction.

As I've written before, heart disease, cancer and stroke are, I'm now convinced, totally avoidable if you change your living habits. Alas, most people would rather get sick and die 30–60 years earlier than needed than change their habits. And this, I suspect, includes you — and your children, who learn their habits from you.

Responsibility

Just a minute while I adjust my surplice and cassock before the sermon.

Okay, that's better. Now let's talk about responsibility. Hmm, I see your eyes shifting around guiltily. We're taught from the earliest age to do our best to avoid responsibility, despite the totally fabricated example of George Washington admitting that he chopped down the cherry tree. Most of us would have found someone else to blame, and never mind the hatchet in our hand which we ... er, just picked up.

We know that those "responsible" are going to get punished. "Responsible" has powerful negative connotations.

Now, getting specific, we're also taught by our family, friends, and schools that we can eat anything we want, and if we get sick we go to the doctor and then it's *his* responsibility to cure us. My sermon today is on your agreeing to accept the responsibility for your own health. The things you put in your mouth, spray on your body, inject into it or breathe can make you sick. They have done so and will continue to as long as you refuse to accept the responsibility for your own health.

When you screw up, a doctor may possibly be able to help, though I'm not completely convinced of that. You only have to read a few exposés of the medical industry before you begin to get a different perspective on the medical profession.

If you abuse your body it's mostly a question of when it's going to start breaking down, not if. Which is why I've been such an itch about your doing your homework on nutrition and learning about the dangers of poisons.

For instance, anyone who smokes or drinks Coke® is an abuser and is not accepting the responsibility for their health. Ditto TV dinner addicts, and so on.

Say "Amen."

Wisdom

Just as you can go through your life eating and drinking whatever you feel like, and never mind the consequences to your health — after all, we have doctors to repair the damage you do to your body, right? — we also are taught to go through life doing what we feel like, with no long range goals. Well, we do have to go to school, whether we want to or not — the government forces us and our parents to do that.

On the health aspect, doctors don't actually repair the damage we do, they lessen the pain we've caused. They treat symptoms, not causes. Well, I've written that endlessly, but it hasn't stopped you from smoking, being seriously overweight, drinking beer, and so on. When am I going to stop lecturing to deaf ears and blind eyes? Probably never.

Now, getting to wisdom. This has little to do with inherited IQ. This is a matter of the information you've put into your brain. The slow, painful route for data input is via school, where around 99% of the data you get will be of little use (and soon forgotten). The most efficient mode of data input is via reading books — books written by people who are both experts in their field, and also experts at making the data easy to understand. That kind of weeds out 99.99% or more of the books being published.

How have you used your spare time through your life? Reading books which add to your wisdom? Watching TV? Listening to the radio? Watching sports? Teens waste some of the most valuable years of their lives cruising and hanging around. Or, if they are hams, getting on a round table and talking about nothing at all for hours, days, years. Or chasing DX for a 15-second signal report.

How Come?

Yeah, how come Wayne is writing all these long editorials? One thing I haven't done in all my 47 years of writing editorials is give some background as to how I happened. Well, I figured my readers would be more interested in what I had to say about things than about me personally.

I was born in 1922 in Littleton, NH. My mother was a commercial artist and my dad was an aviator with the Army Air Force, stationed at Langley Field, VA. He took me up in a Martin bomber when I was about two months old, so I got an early start.

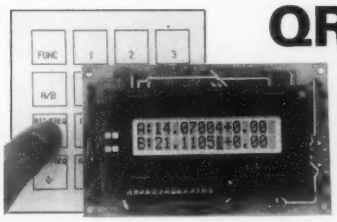
My great grandfather was a pioneer in homeopathy. He was the town doctor in Littleton, where my father also was born. A Green published the first Bible in America, and Greens founded Greene County, NY and Green County, MI. A Greene also founded Rhode Island, but it's a small state, so that probably isn't very important.

By an odd coincidence, all of my ancestors, from every branch of the family, came over here before 1700. Pioneers.

My grandfather was an inventor. A successful inventor. It was his inventions that got Citgo started back in 1910, and during the depression in the 1930s he turned Continental Can around, saving them from bankruptcy.

So I was ripe for amateur radio when I was a kid and started building radios when I

Continued on page 58



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- ✓ 10 Hz to 40 MHz frequency range
- ✓ Digital VFO with 10 Hz resolution & display
- ✓ Variable rate incremental keypad or rotary tuning
- ✓ Dual VFOs (A&B) allows cross band selection
- ✓ 100 memories for VFO A&B
- ✓ Keypad selection of bands
- ✓ RIT (+/- 9.99kHz)
- ✓ Size: L-4" X H-2.5" X D-0.9"

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Special limited time introductory price: $149 (U.S.) plus $10 shipping

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CIRCLE 335 ON READER SERVICE CARD

LETTERS

From the Ham Shack

Feedback from Down Under

Frank Wright VK4SE. Here is an interesting little circuit that can be used to turn Bob Beck's magnetic pulse generator on automatically.

My xenon flash gun takes six seconds to turn on, so I designed an automatic pulse circuit to give a pulse every seven seconds. A 6–8 V SPDT 225 ohm relay, or similar, gives one pulse every seven seconds. Two wires from the normally-open contacts short-circuit the flash button in the gun, activating the xenon tube. If you find it difficult to get to the contacts of the flash button in your gun, it is best to get a camera technician to connect the wires for you.

Alternatively, a camera technician could remove the printed circuit board from the gun (if you can't do it yourself), indicating the flash button wire and the battery wires. It can then be mounted in a neat little case, as I did with mine. I used a six-volt plugpack to power it. C1 is the timing capacitor; select a capacitor that will suit the timing of your flash gun. Start with 10 µF and work upwards until the correct timing is found, or use the formula R1 + R2 x C for time in seconds. It is best not to power the pulse circuit from the same plugpack that powers the flash gun, as initial loading can increase the pulse time.

I use batteries to power mine, either a single 9 V battery or 18 V into a 7809 three-terminal regulator. Both methods work well.

(Ed. note: You can learn more about Bob Beck's magnetic pulse generator and colloidal silver by requesting the appropriate information when you write to Wayne at LDI, Box 1729, Hillsboro NH 03244.)

More Aussie Advice

Frank Wright VK4SE. This circuit is very simple, yet surprisingly good for testing the purity of filtered water from distillers, and other water purifiers, prior to making colloidal silver.

Distillers have a "post-carbon" filter which often contains a fairly high level of impurities when new, and about 10 liters of water has to pass through them before the impurities are washed out. This little circuit will detect impurities and test the water from zero parts per million (PPM) to 20 PPM accurately. Beyond 20 PPM readings get a little less linear. It can be calibrated against a commercial TDS meter, if you can borrow one, or perhaps you can get a pure-water distributor to calibrate it for you. Water from a distiller should give a reading of 1 µA on any 50 µA meter, which is equivalent to zero parts per million. Here are some readings I get on my meter:

6 µA = 5 PPM
12 µA = 10 PPM
15 µA = 15 PPM
20 µA = 20 PPM
23 µA = 25 PPM.

Different meters will, of course, give different readings, but they are all accurate up to 20 PPM. Beyond that the scale becomes gradually more crowded. My tap water reads 42 µA. The water to be tested is poured into a small cup which plugs into the meter. This is how I made my cup:

I used two 50 mm (2-3/16") end stops for PVC pipes. Two stainless steel self-tapping screws (#6-3/4") are screwed into cup **a**, one and one-eighths inch apart, and electrician's wire nuts are fitted on their undersides to connect the wires. Cup **a** sits on top of cup **b** and is held firmly in place with insulation tape or duct tape. To test the water, fill cup **a** to one-eighths inch from the top, plug into meter and operate the DPDT center off switch to "W" (water test position). To test the battery, operate the switch to "B," the battery test position, and get full-scale deflection for a good battery.

Open the circuit one wire to the meter, M1. Set RV2 at maximum resistance. Connect a digital voltmeter to the slider of RV1, and 0 V. Adjust RV1 for a reading of 0.5 V. Reconnect meter m1, short circuit the input jack by operating the switch to the battery test position and adjust RV2 for full scale deflection on the meter. That's all there is to it.

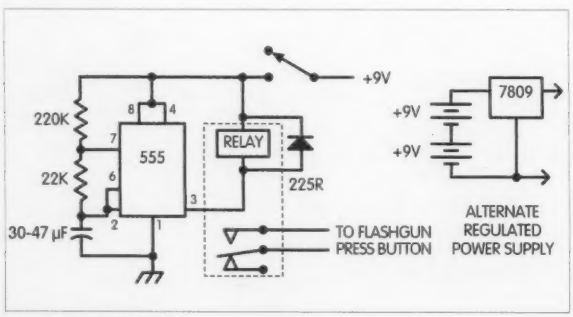


Fig 1. Pulse circuit.

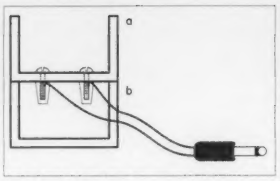


Fig. 2. Water test cup.

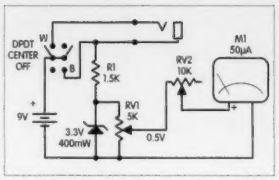


Fig. 3. Water test meter.

My meter fits easily into a small instrument case measuring four inches long by two and a half inches wide by one and a half inches deep (4" x 2-1/2" x 1-1/2").

Readers wishing to communicate directly with Frank Wright VK4SE may write to him at 2 Croxley St., Toowoomba, Queensland, Australia 4350.

Ron Barensten KF7N, Bellevue WA. So you want feedback? In the June issue the "The Fun of Building" caught my eye because I recall an earlier editorial that mentioned Ramsey Electronics. After reading the older comment, I called Ramsey and ordered their small phase-locked FM transmitter that could broadcast audio in the FM band. Some time before you mentioned Ramsey, I had been contemplating ways I could have the same music available in most of the rooms in my home. Running speaker lines everywhere was impractical. I did have small to large hi-fi gear in almost every room, but the thought of running shielded audio lines with all of the attendant technical problems of hum, fidelity loss, and mechanical installation headaches ruled out that approach. Then came your comment about Ramsey. One week later the kit arrived in the mail. I had not put a kit together since the late 50s, but the juices returned quickly. I cut off the top of a corrugated cardboard carton, bent it so that it would sit with the corrugated holes vertical, and inserted all of the small parts with leads in the holes. After a quick look at the construction manual, I began assembly.

Continued on page 55

RAMSEY

World's Smallest TV Transmitters

We call them the 'Cubes'.... Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies- that's a nickel in the picture!

Transmits color or B&W with fantastic quality - almost like a direct wired connection to any TV tuned to cable channel 59. Crystal controlled for no frequency drift with performance that equals law enforcement models that cost hundreds more! Basic 20 mW model transmits up to 300' while the high power 100 mW unit goes up to 1/4 mile. Audio units include sound using a sensitive built-in mike that will hear a whisper 15 feet away! Units run on 9 volts and hook-up to most any CCD camera. Any of our cameras have been tested to mate perfectly with our Cubes and work great. Fully assembled - just hook-up power and you're on the air!

C-2000, Basic Video Transmitter Cube.....$89.95
C-3000, Basic Video and Audio Transmitter Cube.....$149.95
C-2001, High Power Video Transmitter Cube.....$179.95
C-3001, High Power Video and Audio Transmitter Cube.....$229.95

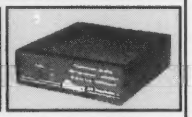
Super Pro FM Stereo Radio Transmitter

A truly professional frequency synthesized FM Stereo transmitter station in one easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set frequency easily with the Up/Down freq buttons and the big LED digital display. Plus there's input low pass filtering that gives great sound no matter what the source (no more squeals or swishing sounds from cheap CD player inputs!) Peak limiters for maximum 'punch' in your audio - without over modulation, LED bargraph meters for easy setting of audio levels and a built-in mixer with mike and line level inputs. Churches, drive-ins, schools and colleges find the FM-100 to be the answer to their transmitting needs, you will too. No one offers all these features at this price! Kit includes cabinet, whip antenna and 120 VAC supply.

We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.

FM-100, Professional FM Stereo Transmitter Kit.....$299.95
FM-100WT, Fully Wired High Power FM Transmitter.....$429.95

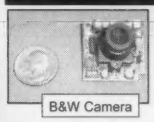
AM Band Radio Transmitter

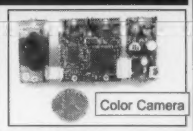


Ramsey AM radio transmitters operate in the standard AM broadcast band and are easily set to any clear channel in your area. Our AM-25, 'pro' version, fully synthesized transmitter features easy frequency setting DIP switches for stable, no-drift frequency control, while being jumper setable for higher power output where regulations allow. The entry-level AM-1 uses a tunable transmit oscillator and runs the maximum 100 milliwatts of power. No FCC license is required, expected range is up to 1/4 mile depending upon antenna and conditions. Transmitters accept standard line-level inputs from tape decks, CD players or mike mixers, and run on 12 volts DC. The Pro AM-25 comes complete with AC power adapter, matching case set and bottom loaded wire antenna. Our entry-level AM-1 has an available matching case and knob set for a finished, professional look.

AM-25, Professional AM Transmitter Kit.....$129.95
AM-1, Entry level AM Radio Transmitter Kit.....$29.95
CAM, Matching Case Set for AM-1.....$14.95

CCD Video Cameras





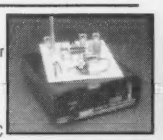
If you're looking for a good quality CCD board camera, stop right here! Our cameras use top quality Japanese Class 'A' CCD arrays with over 440 line line resolution, not the off-spec arrays that are found on many other cameras. You see, the Japanese suppliers grade the CCDs at manufacture and some manufacturers end up with the off-grade chips due to either cost constraints or lack of buying 'clout'. Also, a new strain of CMOS single chip cameras are entering the market, those units have about 1/2 the resolution and draw over twice the current that these cameras do - don't be fooled! Our cameras have nice clean fields and excellent light sensitivity, you'll really see the difference, and if you want to see in the dark, the black & white models are super IR (Infra-Red) sensitive. Our IR-1 Illuminator kit is invisible to the human eye, but lights the scene like a flashlight at night! Color camera has Auto White Balance, Auto Gain, Back Light Compensation and DSP! Available with Wide-angle (80º) or super slim Pin-hole style lens. They run on 9 VDC and produce standard 1 volt p-p video. Add one of our transmitter units for wireless transmission to any TV set, or add our IB-1 Interface board for audio sound pick-up and super easy direct wire hook-up connection to any Video monitor, VCR or TV with video/audio input jacks. Cameras fully assembled, including pre-wired connector.

CCDWA-2, B&W CCD Camera, wide-angle lens.....$99.95
CCDPH-2, B&W CCD Camera, slim fit pin-hole len.....$99.95
CCDPH-2, Color CCD Camera, wide-angle lens.....$149.95
IR-1, IR Illuminator Kit for B&W cameras.....$24.95
IB-1, Interface Board Kit.....$24.95

FM Stereo Radio Transmitters

Microprocessor controlled for easy frequency programming using DIP switches, no drift, your signal is rock solid all the time - just like the commercial stations. Audio quality is excellent, connect to the line output of any CD player, tape deck or mike mixer and you're on-the-air. Foreign buyers will appreciate the high power output capability of the FM-25; many Caribbean folks use a single FM-25 to cover the whole island! New, improved, clean and hum-free runs on either 12 VDC or 120 VAC. Kit comes complete with case set, whip antenna, 120 VAC power adapter - easy one evening assembly.

FM-25, Synthesized FM Stereo Transmitter Kit.....$129.95



A lower cost alternative to our high performance transmitters. Offers great value, tunable over the 88-108 MHz FM broadcast band, plenty of power and our manual goes into great detail outlining aspects of antennas, transmitting range and the FCC rules and regulations. Connects to any cassette deck, CD player or mixer and you're on-the-air, you'll be amazed at the exceptional audio quality! Runs on internal 9V battery or external power from 5 to 15 VDC. Add our matching case and whip antenna set for a nice finished look.

FM-10A, Tunable FM Stereo Transmitter Kit.....$34.95
CFM, Matching Case and Antenna Set.....$14.95
AC12-5, 12 Volt DC Wall Plug Adapter.....$9.95

RF Power Booster

Add some serious muscle to your signal, boost power up to 1 watt over a frequency range of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM Stereo transmitters, providing radio service through an entire town. Runs on 12 VDC. For a neat, professionally finished look, add the optional matching case set.

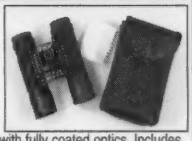
LPA-1, Power Booster Amplifier Kit.....$39.95
CLPA, Matching Case Set for LPA-1 Kit.....$14.95
LPA-1WT, Fully Wired LPA-1 with Case.....$99.95

Treasure Finder Kit

Search for buried treasure at the beach, backyard or park. This professional quality kit can detect metal at a depth of up to 6 inches. Easy to use, just listen for the change in tone as you 'sweep' the unit across the surface - the larger the tone change - the larger the object. Has built-in speaker or earphone connection, runs on standard 9 volt battery. Complete kit includes handsome case, rugged PVC handle assembly that 'breaks down' for easy transportation and shielded Faraday search coil. Easy one evening assembly. This nifty kit will literally pay for itself! That guy in the picture looks like he found something - what do you think it is - gold, silver, Rogaine, Viagra? You'll have fun with this kit.

TF-1, Treasure Finder Kit.....$39.95

Binocular Special



We came across these nice binoculars in an importers close-out deal. Not some cheap in-line lens jobs, these beauties have roof prisms, a super nice rubber armored housing over light weight aluminum. 10 x 25 power with fully coated optics. Includes lens cleaner cloth, neck lanyard and nice carry case. For extra demanding use in bright sun, choose the EX module with ruby coated Objective lens. First quality at a close-out price! We've seen the exact same units with the 'Bushnell' name on them being sold for $30 more!

BNO-1, Binoculars and case.....$24.95
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No SAREX, but Walter's Back!

While the Space Amateur Radio Experiment (SAREX) payload won't be aboard the shuttle flight that carries US senator and astronaut John Glenn into space this fall, renowned former TV newsman Walter Cronkite KB2GSD will be back in the anchor chair for the historic flight.

Now 81 and retired from his long-held anchor position at CBS since 1981, he will report on Glenn's return to space for CNN. Cronkite, who anchored Glenn's original 1962 space mission, will cover Glenn's nine-day mission aboard the space shuttle *Discovery*, including the October 29 launch and November 7 landing.

Two hams, US astronaut Scott Parazynski KC5RSY, and European Space Agency astronaut Pedro Duque KC5RGG, of Spain, will be among the international crew aboard *STS-95*.

From *The ARRL Letter*, via September 1998's *Badger State Smoke Signals*, acting editor, Jim Romelfanger K9ZZ.

"... and Now for the Weather ..."

Packing winds of more than 100 miles an hour, Hurricane Georges slammed into the Mississippi coastline September 28th, 1998. Alabama and Florida were hit hard as well. More than two feet of rain caused extensive flooding. Before, during, and after Georges' approach, radio amateurs were busy, providing communications support. Tom Moore KL7Q is a District Emergency Coordinator in Lee County, Alabama. He says hams in Alabama's Mobile and Baldwin counties had their hands full.

According to Moore, communications took place on a variety of bands, including VHF, HF, 75 and 40 meters.

Many different amateur radio groups pulled together to provide communications support to Red Cross and emergency management agencies. Moore says hams were active in more than half a dozen south Alabama counties, including Covington County.

Hams also provided SKYWARN support services because of Georges' threat of tornadoes, he added.

Farther inland, hams in west Alabama were busy helping storm refugees. Radio amateurs in Tuscaloosa manned two locations for the Red Cross, including a storm shelter.

Before Hurricane Georges made landfall in the United States, it was responsible for a lot of death and destruction across the Caribbean. And ham radio was there as Georges blew away most traditional lines of communications. The Hurricane Watch Net was active on 14.325 MHz to coordinate storm reports with W4EHW at the National Hurricane Center. Hurricane Watch Net Manager Jerry Herman N3BDW said that the net got good reports from Cuban hams.

"Arnie CO2KK was passing radar data and observations that the Hurricane Center was not getting from official sources," he reported. Another net handled health and welfare traffic on 14.283 MHz.

Meanwhile, hams in Puerto Rico were assisting in the aftermath of Hurricane Georges, which inflicted heavy damage in parts of the Commonwealth. Some amateurs have been able to return to the airwaves.

"Hams have made a difference here," stated Rafael Medina NP3HA, in Guaynabo. Medina says he used the WP4KYP UHF repeater to make contact with WP4EZC who, in turn, contacted his relatives to inform them his family was OK.

"I also used the repeater to contact people on the center of the island to gather information and needs from the counties there," he said.

He also passed along VHF repeater traffic to coordinate local needs. "Civil Defense is using hams to operate the repeater to gather information from different regions of the island," he said.

"They are providing service to the police and medical services." Medina said government agencies were taking advantage of communication capabilities provided by ham repeaters that remained up.

Power was knocked out over much of Puerto Rico, and telephone service remained spotty. According to Internet reports, Hurricane Georges took out five ham radio towers at the QTH of well-known contester Pedro Piza NP4A.

As Hurricane Georges faded into oblivion, there were two other hurricanes out in the Atlantic, and hams remained on alert for whatever Mother Nature had in store.

TNX Bill Pasternak WA6ITF at *Newsline*.

Where Were You On the Morning of the 27th?

The National Radio Astronomy Observatory in Socorro, New Mexico, needs hams to file reports on what they heard on any band on Sunday, September 27th, especially on 40 meters and below. That's because September 27th was the day that a major gamma ray burst from a neutron star 15,000 light years away hit our Earth.

This solar event occurred at 1022 UTC. The burst was so strong, it ionized the E- and F-layers on the night side of the Earth. It also ionized the D-layer for extreme absorption for many minutes, and saturated gamma and X-ray sensors on satellites.

This was an extremely rare astronomical event, caused by a generation of power so intense it is almost beyond explanation.

Only two other major gamma ray bursts have ever been detected, one in 1979 and another in 1984.

Paul Harden NA5N, at the New Mexico observatory, says that experimental physics Very Low Frequency monitoring circuits maintained by Stanford University recorded radio wave absorption down to the tens of kHz. But, because this event occurred in the very early morning hours in the US, there is virtually no record of it.

This is where *you* come in.

If you have any recollection of this event, or specific data from, say, a QSO in progress, then Paul Harden wants to hear from you. His E-mail address is [pharden@nrao.edu].

NA5N says that this is a real opportunity for hams to make a contribution to a rare scientific study if you were lucky enough to witness it in some form or another.

TNX Jay Miller WA5WHN in Albuquerque and Bill Pasternak WA6ITF at *Newsline*.

The Ham's 10 Commandments

•Thou shalt have no other hobby but radio.

•Thou shalt not transmit unto others signals that thou canst not read thyself.

•Thou shalt love, honor and obey the Radio Inspector, that thy days as a ham may be lengthened.

•Thou shalt not covet thy neighbor's beam, nor his final, nor his DX, nor his YL, nor anything that is his.

•Thou shalt not screw down thy gear, lest thy neighbor take offense at thine installation; rather should thou keep a keen eye on him.

•Thou shalt not, when emergency comes upon thee, hold back thy assistance.

•Thou shalt not jam thy fellow ham's signal, lest he should jam thine.

•Thou shalt take offense at thy harmonics, and descend lustily upon them, ere they crawl down thy neighbor's antenna.

•Thou shalt ever keep the *ARRL Handbook* at thine elbow, whence shall thy knowledge of radio improve.

•Difficult as it may be, thou shalt even consider a CW operator a human being, dealing with him by tact and diplomacy.

Drafted by Bob Taylor ZS6CO (SK). Submitted by Alf Zeller ZS6AA (SK). Adapted by Johann von Rooyen ZS6L, and seen in September 1998's *Static*, newsletter of the North Hills ARC of Wexford PA. Also seen in the September 1998 issue of *NOARS Log*, newsletter of the Northern Ohio ARS, Mike Willemin W8EU, editor, so chances are pretty good you'll see it somewhere else, too!

FCC Shifts Amateur Radio Enforcement Functions

The Federal Communications Commission announced a change in the handling of enforcement actions concerning the Amateur Radio Service. As of September 1, 1998, the Compliance and Information Bureau is assuming the duties of policing the activities of the nation's 750,000+ hams. Up until now, ham radio rules enforcement has been under the purview of the Wireless Telecommunications Bureau and its predecessors.

The change is the result of an internal arrangement between the Compliance and Information Bureau and the Wireless Telecommunications Bureau. Under it, all investigation, evaluation, and processing of radio amateur-related enforcement matters has been transferred to the C.I.B.

What this means in the real world of enforcing the Part 97 rules is unclear. Officially, the FCC seems to view the move as nothing more than an internal bookkeeping shift. But some insight as to what it really might mean may be found in the words of the FCC's Joe Monie. Monie was speaking at an FCC Forum at September's Radio Expo in Chicago. According to Monie, the Wireless Telecommunications Bureau will no longer handle complaints of interference. The Compliance and Information Bureau will be responsible for that function.

Monie warned rules violators to look for stepped-up enforcement, to the best of the bureau's ability, based on the resources and funding available.

TNX Bill Pasternak WA6ITF at *Newsline*.

Useful Internet Proverbs

•Home is where you hang your @.
•The E-mail of the species is more deadly than the mail.
•A journey of a thousand sites begins with a single click.
•You can't teach a new mouse old clicks.
•Great groups from little icons grow.
•Speak softly and carry a cellular phone.
•C: is the root of all directories.
•Don't put all your hypes in one home page.
•Pentium wise; pen and paper foolish.
•The modem is the message.
•Too many clicks spoil the browse.
•The geek shall inherit the Earth.
•A chat has nine lives.
•Don't byte off more than you can view.
•FAX is stranger than fiction.
•What boots up must come down.
•Windows will never cease.
•In Gates we trust.
•Virtual reality is its own reward.
•Modulation in all things.
•A user and his leisure times are soon parted.
•There's no place like <http://www.home.com/>.
•Know what to expect before you connect.
•Oh, what a tangled Web site we weave when first we practice.
•Speed thrills.
•Give a man a fish and you feed him for a day; teach him to use the Net and he won't bother you for weeks.

Borrowed from the September 1998 issue of *ARNS Bulletin*, Steve Auyer N2TKX, editor, who got it from the July/August 1998 issue of *The LongWire*, the newsletter of the Liverpool Amateur Repeater Club, Bob Jackson WB2BJW, editor.

Amateur Radio Bumper Stickers ... as seen in lots of places!

•Old radio nuts never die, they just fade into the noise.
•Old boat anchor users never die, they just go down the tubes.
•Save heavy metal—recycle a Hammarlund or Johnson!
•No glass, no class!
•73, 88, and 6146
•If you have to ask "What's a boat anchor?," you won't understand the answer.
•Real radios glow in the dark!
•Keep your eyes on the meter and your nose off the plate cap.
•807s for everyone!
•Honk If You Love Slide Rule Dials
•I Brake for Hamfests!

Thanks to the September 1998 issue of *Static*, newsletter of the North Hills ARC of Wexford PA.

Why Radio Amateurs Are Called "Hams"

Have you ever wondered why radio amateurs are called "HAMS"? Well, it goes like this: The word "HAM," as applied in 1908, was the station call of the first amateur wireless stations operated by some amateurs of the Harvard Radio Club. They were Albert S. Hyman, Bob Almy, and Poogie Murray. At first they called their station "Hyman-Almy-Murray." Tapping out such a long name in code soon became tiresome and called for a revision. They changed it to "HYALMU," using the first two letters of each of their names. Early in 1910, some confusion resulted between signals from the amateur wireless station "HYALMU" and a Mexican ship named *Hyalmo*. They decided to use only the first letter of each name, and the station call became "HAM."

In the early pioneer days of unregulated radio, amateur operators picked their own frequency and call letters. Then, as now, some amateurs had better signals than commercial stations. The resulting interference came to the attention of congressional

Continued on page 56

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The popularity of high-altitude amateur radio balloon launches has increased exponentially within the last seven years. A balloon launch that I organized in 1991 for the Dayton Amateur Radio Association included a veteran recovery team from Indianapolis who volunteered to participate in the chase. As luck would have it, the balloon was hijacked by the jet stream, and in less than 50 minutes, the balloon payload parachuted back to *terra firma* over 115 miles away in the Wayne National Forest—the only part of Ohio where the lines on a topographical map resemble the scan lines on a high-resolution monitor!

The signal path through the many "hollers" and ridges was so convoluted that it was just about impossible to pick up a signal from the payload resting on the forest floor. By the time a private aircraft flew over the suspected landing area, the batteries had gone dead and the package had fallen silent. For the next eight months, the payload lay undisturbed, until it was found by a turkey hunter, who obligingly called the telephone number on its exterior and claimed the reward. The package did not contain the one feature that would have meant quick retrieval: a long-term beacon operating at low power.

I immediately decided that the *next* balloon flight would contain an additional low-power beacon transmitter that would assist, if needed, in a speedier recovery. After toying with a few ideas, I built a small QRP transmitter that contained a number of useful features.

The ideal transmitter would have a low parts count and would operate on two meters FM, so almost anyone who owned a two-meter radio could participate in the recovery operation. Low power was also a requirement, to ensure that reserve battery capacity would not be a limiting factor. Extra battery time can be the difference between being lost or found. Sturdiness is also a must—a balloon payload makes a lousy place to store fragile items!

As a spin-off of the balloon recovery transmitter, I designed a similar QRP FM two-meter foxhunt transmitter, powered by a standard nine-volt battery, that has proven to be an extremely popular item; I made it available at my flea market table at the Dayton Hamvention. Simplicity, ruggedness, low power, small size and low cost are features that make this transmitter a popular choice among foxhunters who are looking for a simple transmitter for newcomer hunts in small areas. The FoxTTL is terrific for teaching foxhunting basics in a small park, or even in an auditorium. Maximum range for the FoxTTL is a half mile or so. It is easier for an instructor to demonstrate techniques, such as body shielding, and at closer ranges, the transmitter helps to scale down foxhunting to what normally takes several hundred square miles in some Southern California T-Hunts.

About the design

I designed this circuit so an FM signal with a unique stepped audio tone would be produced with an absolutely minimum number of parts. This is possible by employing a TTL clock oscillator, a 555 timer and a flashing LED. The TTL clock oscillator, designed to provide a clock signal to drive computer video displays, is used as the basic transmitter building block. Cut for 48.3 MHz, the clock oscillator used in this article is made by Cal Crystal Labs, Inc., in Anaheim, California. Using a bandpass filter consisting of four

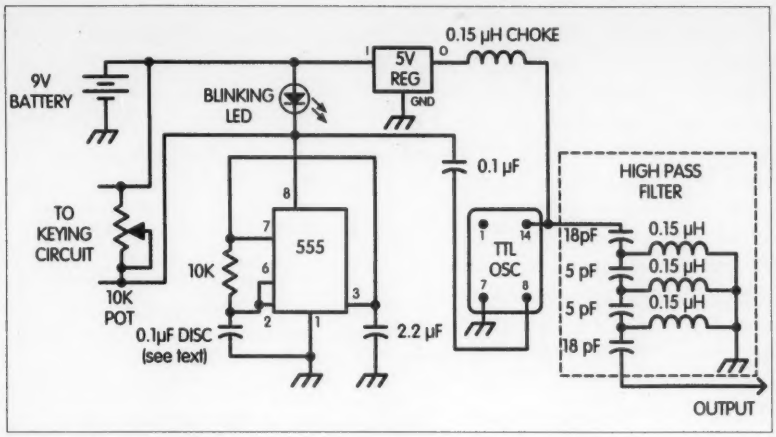

Fig. 1. Schematic of FoxTTL 2-meter transmitter.

capacitors and three RF chokes, the fundamental (48.3 MHz) and the second harmonic are suppressed, and the third harmonic, on 144.900 MHz, remains intact. Power output ends up being around five to 15 milliwatts, depending on battery voltage. The beacon consumes about 35 mA, and you can expect about 10 hours of battery life when using a nine-volt alkaline battery.

The audio oscillator section is created using a 555 timer. The configuration of the audio oscillator, by brute force, "pulls" the transmitter, causing the tones to frequency-modulate the transmitter. Aside from not staying within engineering convention on the manner in which the oscillator is configured, this design "goes outside the box" by utilizing a flashing LED as a means to cause the audio oscillator circuit to decay. The resultant tones that are created can be varied by audio frequency and cadence, with a single potentiometer. Nope, I have never seen an LED employed in this manner. By bridging the LED, an 1800 Hz tone is created and an additional IDer circuit can add an ID tone to the device by simply shorting out the flashing LED leads. This approach further reduces the overall parts count. You've seen it here first: If it works, don't knock it!

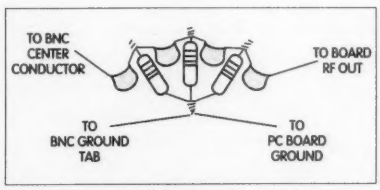

Fig. 2. Layout of the bandpass filter.

Construction

Point-to-point soldering on a small perfboard will work with this project, although I have found that deviation levels are affected, depending on parts placement and lead length. (Boards and parts available: See end of article.) The high-pass filter, consisting of four capacitors and three chokes, is not part of the PC board layout. The transmitter will function without it; however, good engineering practice requires this filter to be employed in the design. See **Fig. 2** for the layout of the high-pass filter. I built the filter separately and kept all lead lengths to an absolute minimum. The resultant "mini circuit" is bridged between the PC board and BNC connector.

Remember to observe the polarity of the flashing LED. The long lead is the positive side of the component.

The 0.1 µF disc capacitor (marked 104) (see **Sources**, below) used in this project was, oddly, the only component critical to the FoxTTL's proper operation. Substitutions of similar-value capacitors of different manufacture produced mixed results, probably due to inductance (not capacitance) that was critical to the circuit's operation. The cadence and tone adjustment potentiometer worked best with the selected disc

Continued on page 12

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Photo A. *You can have it this way, or this way …*

Build the FoxTTL

continued from page 11

capacitor. Later substitutions of this component caused needless hours of head-scratching!

After assembling the high-pass filter and circuit board, I decided to go ahead and "pot" the circuit using automotive Fiberglas™ resin. Pot the circuit in Fiberglas resin? Think of it this way: You may have seen or heard about insects becoming entrapped in some tree sap that eventually turned into amber. Funny thing is, those insects look like they got stuck only yesterday, yet carbon dating indicates that they became entombed, in some cases, over 10 million years ago. Carry this idea over to protecting a circuit—and who knows? Maybe 50,000 years from now someone will power one of these circuits up and the procedure may create a new form of archeology called "fossil electronics." All joking aside, this technique will ensure that the circuit really will be indestructible in the worst possible conditions. By mixing the Fiberglas resin with a catalyst, you'll have the material hardening in about half an hour. If you elect to pot your circuit, make sure you conduct this procedure out-of-doors as the fumes will spontaneously cause you to start agreeing with everything that Wayne Green writes. Also, make sure that it is at least 70° Fahrenheit when you mix the material, as cooler temperatures will slow down the curing process. It's imperative you follow the directions listed on the Fiberglas resin container, due to the caustic nature of the material. By adding a little acrylic pigment (about 10 drops per ounce of resin) you can make the completed package look like a commercially manufactured product.

I also elected to bring out the LED in a position such that the potting material would leave it partially uncovered. The flashing LED serves a dual purpose: first, as an indication that the battery and circuit are working; and second, as a means of creating an unusual beacon tone. Also, be aware that Fiberglas resin has a tendency to infiltrate switches and potentiometers prior to curing. When in doubt, cover these components with a little bit of modeling clay to prevent any Fiberglas intrusion on possible entry points.

If your circuit board is mounted in the metal enclosure available from Midwest Surplus (see **Sources**), make sure that it does not come in contact with the side walls of the enclosure. This can be accomplished by taping the interior portion of the enclosure. As the tape is not visible once the Fiberglas is poured in, this is the best means to ensure that shorts do not develop prior to the Fiberglas setting up.

Parts List

Qty.	Description
4	.15 µH choke
1	2.2 µF 50 V electrolytic capacitor
1	0.1 µF 100 V axial capacitor
1	0.1 µF disc capacitor
2	5 pF disc capacitor
2	18 pF disc capacitor
1	10 k potentiometer
1	10 k 1/4 W resistor
1	9 V battery
1	9 V battery connector
1	SPST switch
1	BNC connector (chassis mount)
1	BNC Protecto-cap
1	battery holder
7	screws & mounting nuts
1	collet type potentiometer knob
1	PC Board
1	TTL clock oscillator (48.3 MHz fundamental)
1	555 timer
1	blinking LED

Table 1. *Parts list.*

Operation

When the transmitter is powered up, adjust the potentiometer for the desired cadence/tone. As a side note, when the flashing LED is exposed to bright sunlight, internal resistance changes within the LED and this may speed up the cadence of the tone—something to keep in mind if the LED is facing the sun on a partly cloudy day.

FAR Circuits has made available prepared circuit boards (etched, drilled and silk-screened). The boards are made of G-10, FR 4 material, 1 oz. copper, solder-coated, and drilled. Included is an LC network (capacitor/coil form combination) etched on this board, but that is not utilized for this particular circuit layout. See **Sources** below if you are interested in building the project using the available circuit board.

Sources

FAR Circuits
18N 640 Field Court
Dundee IL 60118
[http:www.cl.ais.net/farcir/]

The circuit boards are $4.25 each, plus $1.50 shipping and handling *per order*. Orders are accepted only by surface mail or FAX. No orders will be accepted via E-mail. All orders must be prepaid by check or money order, VISA or MasterCard. Credit card orders will include a $3.00 service charge and may be FAXed to (847) 836-9148. To order, please indicate the "ship to" address, home phone number, quantity of boards, magazine and month the article appeared.

All parts for this project, excluding circuit board, antenna and battery, can be ordered as a kit for $20.00 from

Midwest Surplus Electronics
P.O. Box 607

Continued on page 20

The Evolution of Power Supplies

Part 1: dynamotors and vibrators.

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266-4025

If you've been around ham radio very long you've seen a number of power supply types, but are you aware of how they've changed over the years? What is referred to as a "power supply" is the interface between the ordinary wall plug and a radio, or between an automobile battery and a radio. The evolution of the interface device has seen a great many changes over the past 60 years. Reviewing the various common types raises feelings of nostalgia for some hams, while for others it is an educational step through historical memorabilia.

Latecomers to ham radio are familiar with radios that require a 12-volt power supply, because most radios today are of a solid state design that operates directly off an automobile battery. However, prior to semiconductors, almost all electronic equipment used vacuum tubes—which required a much higher voltage than most semiconductors.

Throughout the history of radio, power supplies have been available that obtain power from commercial power mains, and we think of that power as being typically 120 VAC which must be stepped up or down in voltage level to meet the radio's requirements. The change in voltage level has been provided by a power transformer (**Fig. 1**), of which there are many variations in the rectifier and filtering circuits. A DC voltage is obtained by rectifying the AC output from the transformer and, for vacuum tubes, an AC voltage was also provided to the heaters.

AC power supplies have gone through a transition from heavy iron transformers to powdered iron switching circuits, but power supplies for mobile radio applications have had an even greater evolution. To show the various steps in the evolution, we will discuss some of the more popular mobile supplies, starting here in Part 1 with the dynamotor and vibrator versions. Part 2 will pick up with switching power supplies of the types used in mobile and home computer applications.

Dynamotor

The dynamotor power supply was developed during the late 1920s and early 1930s for use in automobile car radios. An outline of one is shown in **Fig. 2.** At the time, they were called rotary converters (also called rotary transformers), with many applications both inside and outside of automobile radios. During World War II, dynamotors were produced in huge quantities for military applications, and following the war many dynamotors became available to hams through the surplus market.

Perhaps one of the most famous dynamotors was called the PE-103. It was capable of being operated from either a six- or 12-volt car battery. The output voltage was 300 VDC (600 V output if 12 V was applied to the 6 V input) which made it ideal for mobile ham transmitters. Another feature of the PE-103 was that it could be remotely turned on and off. This made it more convenient to use, particularly during short transmission periods after which it would be turned off. The armature inertia was a little troublesome during a push-to-talk situation because

Continued on page 14

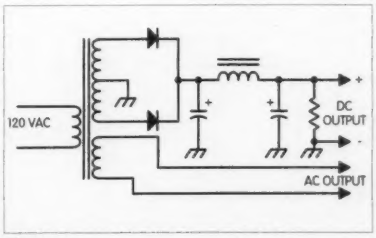


***Fig. 1.** Typical AC-powered supply.*

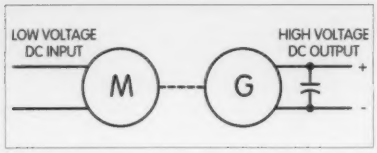


Fig. 2. Typical dynamotor or rotary transformer.

The Evolution of Power Supplies

continued from page 13

the output voltage would neither rise nor drop off rapidly.

A dynamotor is, in essence, a motor-driven generator with the motor being powered by a DC voltage. Being motor-driven, the generator operates like a rotary transformer in which the magnetic lines of force created in the field windings cut the armature wires, causing a voltage to be developed across the armature winding. The voltage developed across the armature is AC, but a DC voltage will be obtained at the output because a commutator is used. An AC voltage could be obtained from the armature if slip rings were used instead of the commutator. If used that way, it would be called an inverter, but for use with radio a DC voltage is required, so a commutator is used.

The commutator and brushes provide the equivalent of a mechanical rectifier. Because the brushes had a tendency to spark, noise was introduced into the DC output, requiring filtering in a manner similar to that used in a modern AC-powered DC supply. One of the phenomenal things about the dynamotor was that it was extremely reliable; it would take a lot of punishment and continue to operate. Those dynamotors that haven't become part of the local landfill would still operate reliably today.

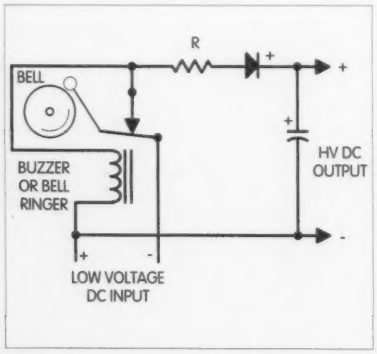


Fig. 3. Buzzer or bell ringer power supply, DC output obtained from rectified flyback voltage.

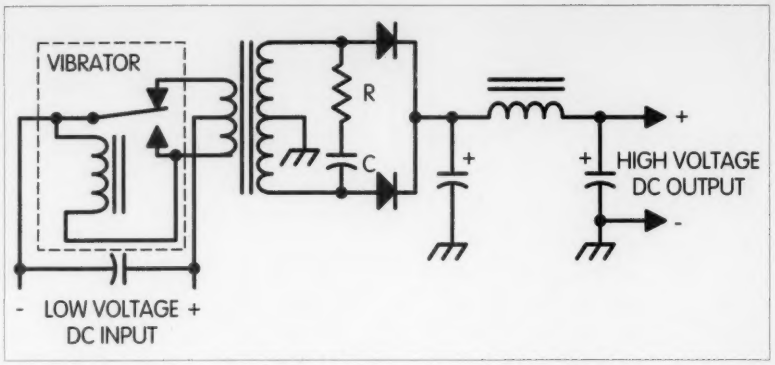


Fig. 4. Vibrator power supply used in early car radios. Typical rectifier was an 0Z4, 6X5, or 6X4 tube.

Vibrator

Vibrator power supplies were developed in parallel with the dynamotor, with the objective of reducing the amount of weight and the size, and improving the efficiency of the power conversion process. Where a dynamotor might have a power conversion efficiency in the range of 25–40%, the vibrator supply could achieve 60–70%.

Vibrator power supplies were used in car radios well up into the late 1960s, when high perveance, low voltage tubes became popular. These tubes operated directly off the 12-volt battery, as semiconductors do today. A high voltage was not required.

The transition to solid state occurring during the 1960s reduced the use of low voltage tubes. However, hams still use high voltage tubes in some mobile applications, so high-voltage power conversion equipment is still required. Today, though, the power is obtained from a switching power supply instead of from either a dynamotor or vibrator supply.

The earliest vibrator supply began as a development from a buzzer circuit as shown in **Fig. 3**, where the high voltage flyback from the coil was rectified and used as DC power. The efficiency of the buzzer supply was perhaps in the 5–15% range, and any significant load would "kill" the buzzer action and shut down the supply. However, the concept of DC–DC power conversion was clearly demonstrated.

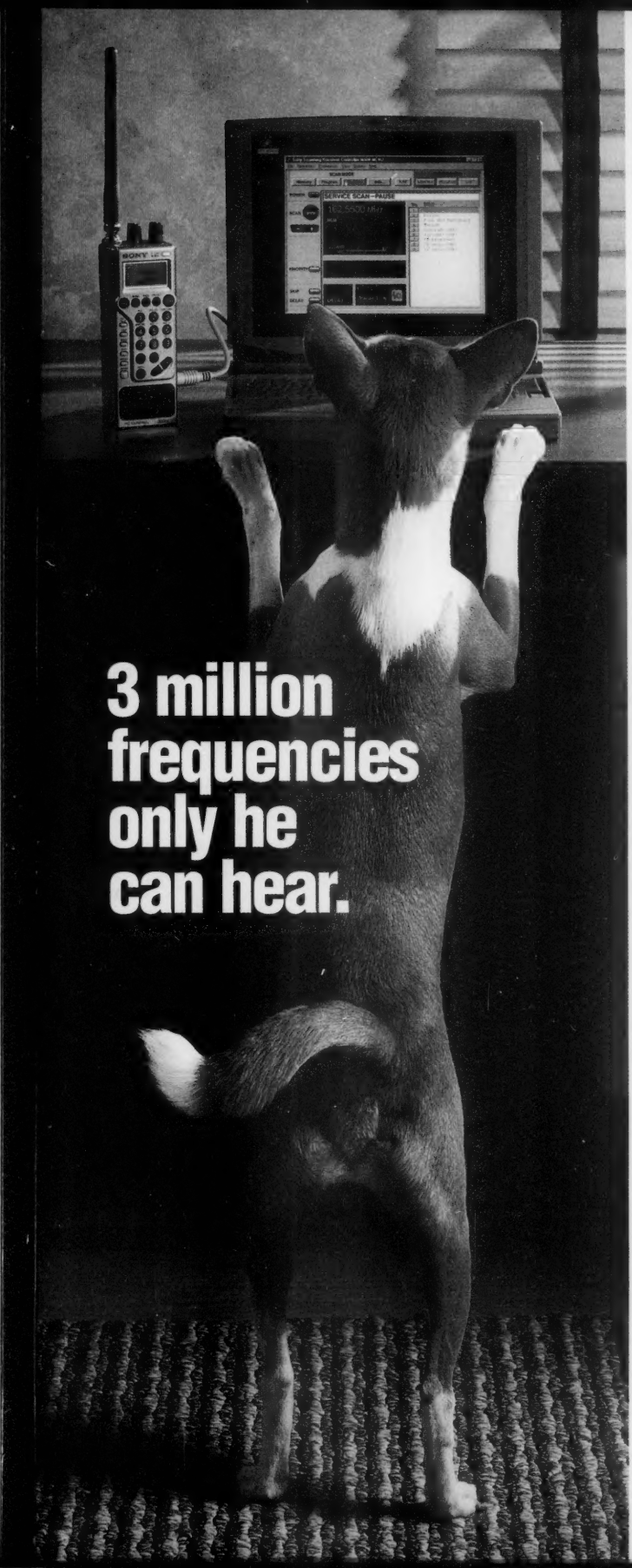
Vibrator power supplies operate in a manner similar to a buzzer, in that the DC input is chopped by the vibrator contacts to create a pulsating DC current flow in the primary winding of the transformer. Later model vibrator supplies, as shown in **Fig. 4**, operated from a six- or 12-volt system (with some World War II military and aircraft vibrator supplies being operated from 24-volt systems).

In operation, the transformer must transfer power from the primary winding to the secondary. For that to happen, the current flow in the primary must be continuously changing in magnitude. The changing current creates a changing magnetic field around the primary winding, where the moving lines of force will cut the wires of the secondary winding and cause a voltage to be developed across it.

At this point, the process is exactly the same as that which occurs in a transformer being operated from an AC source such as a wall outlet. However, the waveform caused by the vibrator is closer to that of a square wave than that of a sine wave as obtained from the wall socket.

Once a voltage was developed across the secondary winding, it could be rectified to produce a DC voltage in the same manner as that of an AC-powered supply. Because of the abrupt opening and closing of the vibrator contacts which produced the square

Continued on page 33



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Every shortwave listener knows that most shortwave reception seems to fade out during the daytime and become greater during the nighttime or early morning hours. Sometimes those hard-to-get and far distant stations can only be heard for a few minutes, then out she goes! You might live where a long antenna cannot be erected and only a short length antenna must do. Here is where the SMD RF booster comes into the picture.

The untuned SMD booster can help pick up those weak shortwave stations at all times. This booster amp works best on small two- or three-transistor or IC shortwave receivers that may lack gain and selectivity. When the SMD booster is connected to a regenerative SW receiver, it prevents oscillations from feeding back into the antenna and helps boost the shortwave reception (**Photo A**).

The surface mounted booster was constructed of tiny electronic components, which take up only a small space inside the receiver cabinet. In fact, you can mount the booster amp just about any place inside or outside the receiver. Simply spot the small 1-1/4- x 2-inch chassis with epoxy or silicone cement on the rear panel next to the outside antenna jack. This small booster can operate from an inside or outside 4.5 to 9 V power source.

Besides a two-stage RF booster, a high-pass filter network is found between Q1 and Q2. Sometimes, when listening to the 80 or 160 meter band, a local broadcast station might break through, especially on home-built shortwave receivers. The NPO capacitors, C2, C3, and C4, with L1 and L2, form a high-pass filter network to eliminate that high-powered local broadcast station between 500 and 1750 kHz. This high-pass network has a 50 Ω input and output impedance.

Circuit operation

The surface mounted (SMD) components are found in the untuned booster stage that can amplify RF frequencies from the broadcast band (500 kHz) to 5 MHz. There are no tuned coils in the front end of the RF booster. There are two general purpose SMD transistors (NPN) that operate in series untuned circuits (**Fig. 1**). The outside antenna wire plugs into or connects to J1, and the output of J2 connects to the antenna jack of the shortwave receiver. The input and output booster wires can be inserted in series with the outside antenna jack of the shortwave receiver.

A high-pass filter network was installed between Q1 and Q2 to keep strong broadcast stations from being amplified, especially within the 80 and 160 meter bands. Capacitors C2, C3, and C4, with L1 and L2 (3.3 µH inductance), form a high-pass filter network. The high-pass filter works best on home-constructed shortwave receivers that do not have the gain and selectivity of a commercial SW receiver. If the RF booster overloads the signal on a few stations, a 1 kΩ control can be installed at the antenna circuit of the receiver to attenuate the incoming signal.

Be careful out there

Remember, these SMD components are tiny in size and must be handled with care. The SMD part is so constructed that solder is applied to each end, which lies upon a solder pad of the PC wiring. Q1 and Q2 are so small that a magnifying glass should be used to solder in the three terminal connections. Too much heat can destroy these SMD transistors. Keep the B+ source below nine volts so as not to damage the electrolytic capacitor. Choose a

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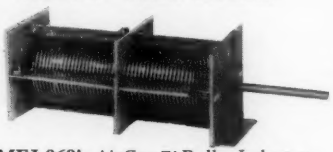

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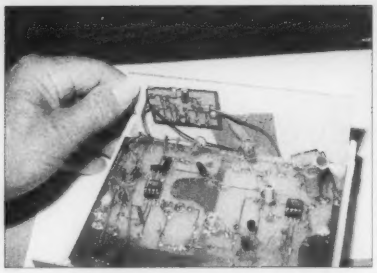

Photo A. *The small RF booster can be mounted on the back panel near the shortwave receiver antenna jack.*

16-volt working voltage electrolytic (C7) so that it will not run warm or break down and short out the voltage source.

Since these SMD parts are so tiny, they can easily be lost or flipped out of sight. Take one component out of the plastic package at a time. Put the other parts back in the package. Place the part upon a white sheet of paper before installation, and measure for correct resistance and capacitor leakage with the 2 kΩ range of an ohmmeter. Place the ohmmeter probe tips at each end of the resistor or capacitor for a correct test. Likewise, check each SMD transistor on the "diode test" of a digital multimeter (DMM), if one is available. How to test transistors with the diode test is explained later in this article.

Grasp the tiny component with a pair of eyebrow tweezers and hold the soldered end over the correct soldering pads. Choose a small-diameter-type solder for those tiny connections. Apply the solder on one pad terminal. Butt the part end up to the pad and solder up. Now solder up the other end with the fine point of a soldering iron. Double-check the soldered connections with a magnifying glass.

The most difficult SMD components to solder into the circuits are the NPN transistors—they have such tiny connections. Try to center the three terminals over the right soldered tabs, with the tweezers. Place a small amount of solder on each pad. Solder in one terminal to hold it into position. Then solder up the other two connections with the fine point of your soldering iron.

Check between each element with the 200 Ω range of the DMM for leakage. Make an in-circuit diode-transistor test of each transistor: You'll want to make sure the transistor was not damaged while you were soldering the connections. The resistance and diode test of transistors, resistors, and capacitors checks parts for damage and that the correct part is at the right location. This ensures that the RF booster will perform after all the parts are mounted.

Choose a 25- or 30-watt battery-type soldering iron to solder up the SMD connections (**Photo B**). If necessary, file down the iron tip to a fine point. Likewise, grind the ohmmeter test probes down to fine points for easy

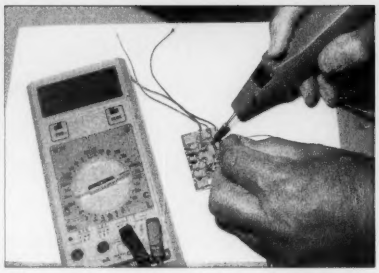

Photo B. *The battery iron is ideal to make soldered connections on the ends of the SMD parts.*

and safe testing. Do not leave the soldering iron on each transistor pad too long, to prevent possible heat damage.

Turn the black side of the SMD resistors upward. You might find a number or resistance value marked on top. Here, a magnifying glass does the job. Most flat-type electrolytic capacitors have the capacity and working voltage stamped on the top side. The white line of C7 (47 µF) should be placed on the positive side of the voltage source. If you use a metal-type SMD electrolytic capacitor, place the black side to the common ground connection. Check the mounted electrolytic capacitor on the 2 kΩ range of the DMM. The electrolytic capacitor should charge and discharge by reversing the test probes, indicating a good connection and normal capacitor, and no shorts or leakage.

Construction

All of the SMD components are mounted upon a 1-1/4- x 2-inch PC board. Simply cut out a piece from a larger copperclad PC board. Clean off the board with an SOS® pad or soap and water. Lay out the PC wiring as shown in **Fig. 2**. Use the dry etched transfer pads for the mounting pads of the small SMD parts. Two IC transfer pads can be used for the base and emitter terminal connections. Then, place one IC pad in the center and above for the collector terminal. Notice that the two SMD transistors are mounted in the center of the board.

The transfer pads are tied together with pieces of transfer lines to form the various circuits. The input and output dots are placed at each end of the

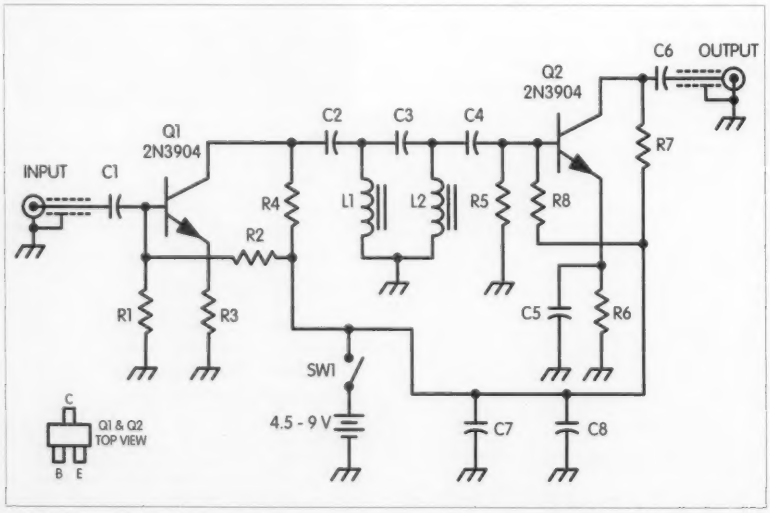

Fig. 1. *The entire RF booster circuit is constructed with surface mounted (SMD) components.*

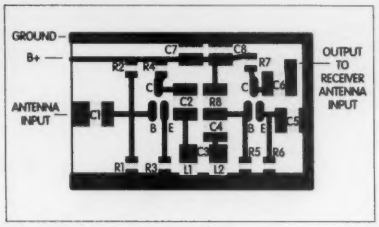

Fig. 2. The part tabs and wiring layout on a 1-1/4- x 2-inch PC board.

board. Place a larger dry transfer line around the outside edge of the PC board for a common ground.

After laying out the PC wiring, the small board can be etched in less than 35 minutes. Remove the PC dry transfer lines, after the board has been etched, with a kitchen scrubbing pad. Clean up and wash off the entire PC board. Double-check each pad and wiring for cracked or bridged connections. If one pad touches another, cut out the excess with a razor blade or craft knife. Tin each pad with solder as the parts are mounted.

Start mounting the SMD components by soldering in each resistor. Before mounting, check the value of the resistor with the ohmmeter. Then, check the resistance once again after the SMD resistor is soldered into position. Check the soldered connection with a magnifying glass. Next, mount all the bypass and coupling capacitors (**Photo C**). Since these capacitors do not have a ground identification line, it does not matter which end is soldered in. Of course, you must observe the correct polarity of an electrolytic capacitor (C7). Now check across each mounted capacitor for possible leakage with the 2 kΩ range of your DMM.

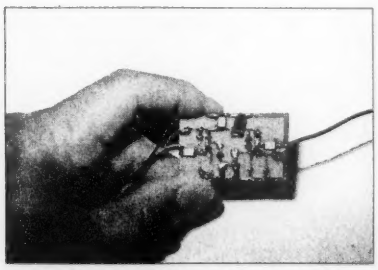

***Photo C.** A close-up view of the miniature SMD components of the booster amp and high-pass filter network.*

Mount L1 and L2, and Q1 and Q2 after all other SMD parts are soldered into the circuit. Check across L1 and L2 after they are soldered in for low-ohm continuity. Test each transistor with the diode test of the DMM. Place the red (positive) probe of an NPN transistor at the base (B) terminal and the black (negative) probe at the collector (C) terminal. You should have a normal diode junction test resistance, somewhere between 700 to 850 ohms, depending on your DMM. Leave the red probe at the base (B) terminal and place the black probe at the emitter (E) terminal. This normal resistance measurement will be within a few ohms higher than the collector measurement or the previous test.

Now reverse the test leads. A normal infinite resistance measurement indicates a good transistor. If a low-ohm measurement below 100 ohms is noted between any two elements, even with reversed test leads, the transistor is leaky. A low resistance measurement (less than 5 Ω) means that the transistor is shorted. The shorted or leaky transistor will have a low-ohm leakage with reversed test leads in both directions. Replace the transistor.

Connecting up

Double-check all soldered connections with a magnifying glass. Solder a 9 V socket harness to the common ground and B+ terminal tabs of the PC board. Connect a short input hookup wire to input terminal C1 and a flexible wire to output terminal C6. Solder a ground wire to the common PC wiring that goes around the outside of PC board. The booster amp is ready for testing.

Testing

Check out the RF booster before mounting inside the shortwave receiver cabinet. Connect the outside antenna jack to the input cable of the booster amp. Temporarily, clip the output terminal wire to the receiver antenna jack. Insert the 9 V battery. Now tune in a weak station.

Quickly, remove the outside antenna wire from the input of the booster and apply it to the SW receiver antenna

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Take critical voltage measurements upon each transistor terminal and compare to the schematic. It is best to take the voltage measurements at the PC wiring of each transistor terminal, to prevent damage to the transistor. Test each transistor with the diode test of the DMM (**Photo D**). Check each transistor for leakage between each terminal on the 2 kΩ range of your ohmmeter. Suspect a leaky transistor or electrolytic capacitor with a high current measurement and a low DC voltage source.

Build the FoxTTL

continued from page 12

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When non-hams see the FoxTTL, I answer inquiries by explaining to them that foxhunting is like trying to find electronic Easter eggs ... but this kind of game becomes serious once the skills are developed and the team is hot on the trail of a lost balloon payload or even a downed plane—it's a skill that just might save a life! 73

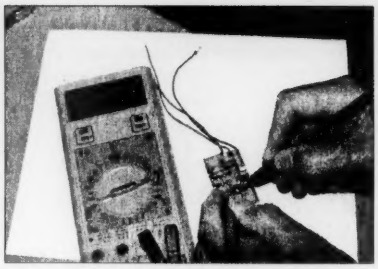


***Photo D.** Check each SMD transistor on the "diode-test" of the digital multimeter (DMM).*

By checking each component with a resistance measurement before and after it is soldered into the circuit, you know the RF amp will perform when the project is completed. Be very careful when soldering all SMD components. Do not apply too much solder or heat from the soldering iron on the tiny transistor terminals. Check each soldered connection with the magnifying glass. This small SMD booster amp can provide better SW reception, can be mounted just about any place, and can operate from a separate battery or from the SW receiver power source. Have fun! 73

Parts List

C1, C5, C6, C8	0.1 µF 50 V NPO ceramic
C2, C3	0.001 pF 50 V NPO ceramic
C4	0.002 pF 20 V NPO ceramic
C7	47 µF 16 V electrolytic
L1, L2	3.3 µH coils *DN10332CT-ND
Q1, Q2	2N3904 *FMMT3904CT-ND
R1, R2, R8	5.6 kΩ 1/8 W
R3, R4, R5, R6, R7	1 kΩ 1/8 W

Miscellaneous Parts: 1-1/4 x 2 inch PC board; solder; hookup wire; etc.

*Digi-Key part number

***Table 1.** Parts list.*

VHF/UHF Signal Source

There's always room for another piece of test equipment!

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266-4025

As hams, we get involved with projects requiring test equipment beyond what we could normally afford or have available. Recently, I was in need of a stable signal source for evaluating and tuning several repeater receivers operating in the 450 MHz band.

After using commercial tunable signal generators, it became apparent that a crystal-controlled signal source was needed to maintain signal stability during critical tuning steps which involved only a single frequency. The problem encountered with the commercial signal generators available to me was that they continued to drift in frequency even after a long warm-up period. In my situation, frequency stability was far more important than frequency accuracy, although very desirable.

Fortunately for me, a Motorola Motrac channel element became available. The channel element is a crystal-controlled Colpitts oscillator designed as a plug-in unit. It uses a fundamental crystal operating within the range of 6–18 MHz. Channel elements are temperature stabilized, with thermistors controlling a varactor across the crystal.

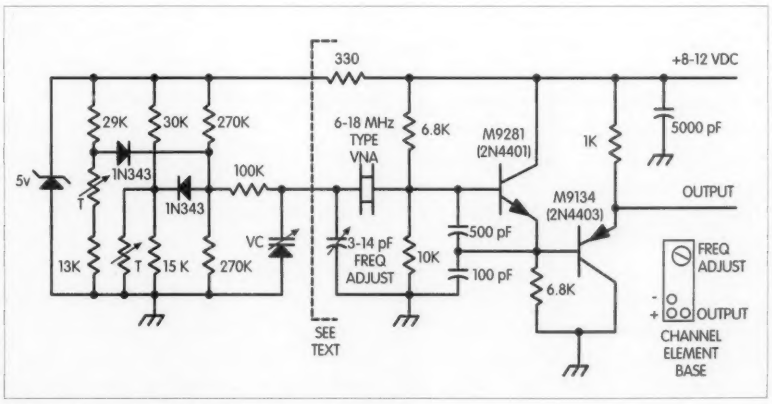


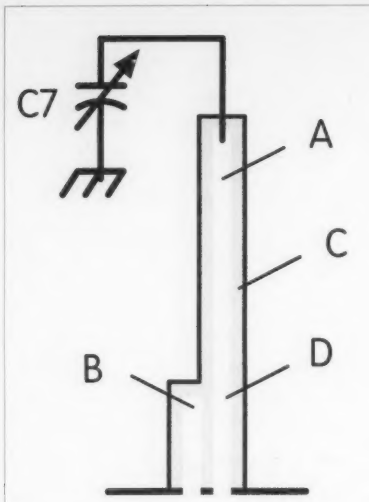
Fig. 1. *Motorola TLN 1086/87 channel element.*

Motorola made two versions of the channel element: one for the receiver and one for the transmitter. The circuit design is slightly different for each, and I'm not sure which version it is that I used, but the schematic is approximately as shown in **Fig. 1**.

The use of a Motorola channel element is really an "overkill" situation for a VHF/UHF signal source project. A Colpitts oscillator and buffer without the frequency stabilizer would be a better choice in this specific application. The section shown to the right of the dotted line in **Fig. 1** is all that's really required for the project. However, I chose to use the channel element as is, without modification—with some conflicting results which will be discussed later.

My channel element came with a 12 MHz crystal. I needed a signal at 450 MHz. I considered several alternatives to obtain the frequency multiplication from the 12 MHz source. Some of the alternatives involved building up a series of transistorized multiplier stages with an output on 450 MHz, using a monolithic amplifier driving a 450 MHz resonator, or using a crystal diode multiplier

Continued on page 22



Element	Freq. Band	
	450 MHz	144–220 MHz
A Resonator	2 1/4 x 1/8"	6 1/4 x 1/8"
B Link	1/2 x 1/8"	1 1/2 x 1/8"
C Spacing	1/16"	1/16"
D Diode Tap	1/2"	1 1/2"
C7	4–18 pF	5–20 pF

Fig. 2. *Stripline dimensions and lengths for different frequency bands.*

VHF/UHF Signal Source

continued from page 21

driving a 450 MHz resonator. The latter was chosen after reviewing the criteria involved.

The criteria for selecting the multiplier technique involve the desired signal level required at the receiver input, amplitude control, stability, and a signal at an output impedance of approximately 50 Ω in order to drive a length of coax. Signal leakage directly from the signal source was a critical factor when tuning sensitive receivers. Typically, the signal level required is between 0.1 and 2 µV at 50 Ω. Yes, it is desirable to have a variable signal level for evaluating the sensitivity of the receiver and for comparing the sensitivity of one receiver to that of another.

As indicated for my signal source, I chose the crystal diode multiplier driving a stripline resonator operating at 450 MHz. The resulting combination was an excellent choice as a source for my receiver tuneup needs.

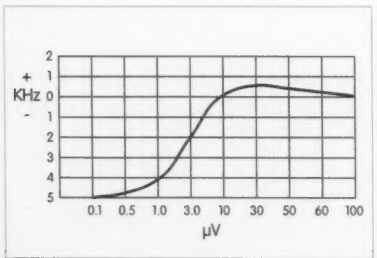


Fig. 3. *Frequency shift relative to output voltage setting.*

Multiplier theory

Before proceeding with the signal source project, perhaps it's desirable to review how a diode can be used as a frequency multiplier. Frequency multipliers operate on the principle of creating distortion of a fundamental (originating) signal. The resulting distortion can be translated into frequency multiples of the fundamental where the shape of the resulting waveform provides an indication of the harmonic content. Examining specific identifiable waveforms provides the necessary insight into frequency multipliers. Because of their predictability, specific waveforms such as sine, square and triangular will be discussed.

A sine wave is a signal waveform having a smooth transition from one voltage level to another. A pure sine wave with its smooth transitions contains no distortion or abrupt changes, and therefore contains no harmonic energy—only the fundamental signal exists.

However, when a square wave is considered, you can observe the abrupt vertical to horizontal transitions. The flat horizontal portion might be considered to be a DC value (low frequency component) that lasts for a short moment in time. The vertical transition between the upper and lower flat portions is rise time (high frequency component) that is usually measured in transition time (i.e., ms, µs, ns).

A square wave is the result of combining a fundamental signal with an infinite number of odd harmonics of the fundamental. The fundamental is also its own first harmonic. A pure or perfect square wave would contain only odd harmonic frequencies of the fundamental with all of the even harmonics being eliminated. In reality, the amplitudes of the odd harmonics are more predominant than those of the even harmonics, but some even harmonic energy remains in a square wave.

Different from both the sine wave and square wave is a triangular waveform that has an appearance similar to a sine wave and a sawtooth. However, the triangular waveform is unique in that the rising and falling transitions are symmetrical with equally linear ramps from one voltage level to another. There is no hesitation or flat spot as with a square wave and no smooth rolling transitions as exhibited by a sine wave. A triangular wave is the result of combining an infinite number of even harmonics from a fundamental, but the fundamental, being an odd harmonic, is not present in the waveform. Like a typical square wave, a triangular wave will exhibit a predominance of even harmonic energy, but it will contain some odd harmonic energy as well.

For a frequency multiplier to work properly, it must have signal energy available at the desired harmonic of the fundamental. Since very few generated waveforms are really pure, they will contain some harmonic energy at many whole-number multiples (i.e., 2, 3, 4, 5, 6, etc.) of the fundamental. In the case of this VHF/UHF signal source project, the 36th multiple of 12 MHz was required to deliver signal energy at 450 MHz. To ensure the presence of harmonic energy in a signal, it is necessary to distort the waveform using any available means. In this case, a crystal diode (point contact) provided a simple and adequate amount of distortion. Because many

harmonic frequencies are present in the output, only one multiple may be of interest.

Selecting the desired harmonic signal with a resonant circuit will tend to create a sine wave signal at the desired harmonic, and the amplitude of the remaining harmonics will be attenuated, but not totally removed. **Fig. 2** provides the data for two resonators, with one covering the frequency range from about 110–225 MHz and the other covering 420–450 MHz. Adjusting the length of the resonator to accommodate a higher or lower band of frequencies is fairly easy. To go higher in frequency, assuming that the resonator is too long, a jumper wire may be soldered horizontally across from ground, to "B", to "A", to ground on the opposite side. The height of the wire short determines the basic frequency of the resonator. To go lower in frequency, assuming that the resonator is too short, is a little more difficult to correct, but is accomplished by increasing the lengths of the "B" and "A" elements by removing copper at the bottom of the slots. Increasing the length of the resonator lowers the resonant frequency.

Signal source project

Most signal generators control the signal output amplitude by using a precision voltage divider. Such a divider is a little difficult to implement in an amateur-built project, so an alternative method was selected. To accomplish a variable output amplitude level control, I chose to vary the supply voltage to the channel element, which worked well in my application.

However, varying the supply voltage on a varactor-controlled oscillator is not without consequence, as shown in **Fig. 3**. The curve shows a shift in frequency as a function of microvolt output, which is caused primarily by the increase in varactor capacitance as the power supply voltage is decreased. This effect is observed primarily at voltages where the internal zener begins to starve. If the shift in frequency becomes an issue, then the varactor and zener control could be eliminated by removing the varactor and associated 100 k resistor as

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9.31	30
10.11	50
11.57	60
12.81	100

Table 1. *Relative signal output level as a function of supply voltage.*

indicated by the dotted line shown in **Fig. 1.** It will be necessary to connect a resistor with a value between 100 k and 1 meg at the varactor location to provide a DC return path to ground for the crystal.

Even without the varactor being in the circuit, I would expect a small frequency shift to remain, due to the junction capacitance changes in the oscillator transistor, but nothing as severe as that caused by the varactor. With that said, I found the signal source to be as good as expected for my application and the frequency shift was tolerable, so no modification to the channel element was performed.

Varying the oscillator supply voltage accomplished the desire for controllable output amplitude. My particular project yielded a signal output which was variable from 0 to 100 µV at 50 Ω. Perhaps one of the more difficult tasks is to calibrate the output amplitude in microvolt values. The technique that I used was to compare the signal level to that of a commercial generator. But it must be understood that the value of the actual output is in its amplitude stability and controllability, not in the actual output voltage value. **Table 1** provides a reference chart of how my signal source performed.

Fig. 4 shows the schematic diagram for the VHF/UHF signal source. An LM317 regulator provides the variable control over the oscillator's supply voltage. To achieve a somewhat vernier control of the voltage, it was necessary to adjust the ratio of the mechanical pot shaft rotation versus the output voltage.

The first step in the process was to determine the maximum and minimum supply voltage that was needed. In my case, the oscillator's output peaked at 12.5 V and ceased to oscillate at 5.5 V. The task then involved selecting the values of resistors R2 and R3 to achieve a nearly full pot rotation to cover the range from 5.5 V to 12.5 V. This expectation was almost achieved by using standard resistor values. Some patching of the R3 value could have improved the low end control, but when in use, the control was adequate.

Construction

Common parts for the project, except for the channel element, are available from many sources. There are no critical parts in the power supply section

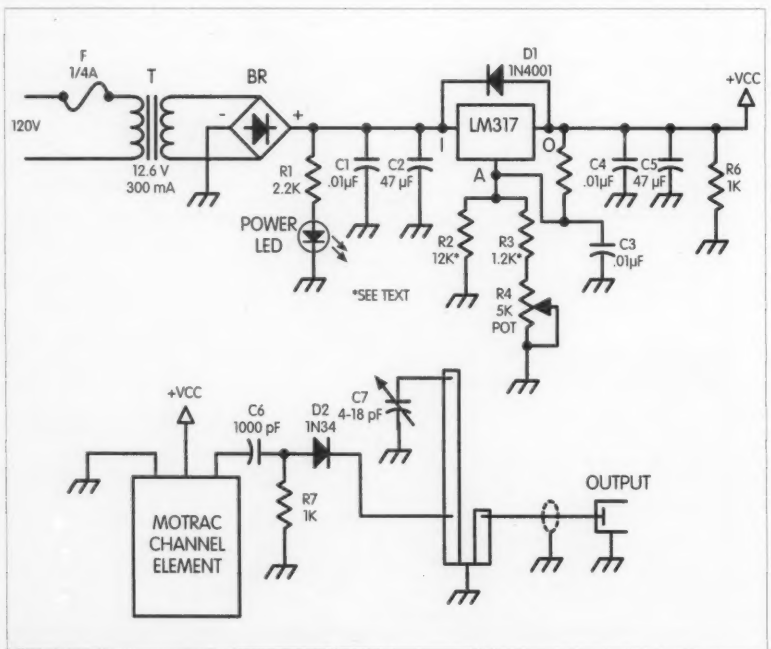

Fig. 4. *UHF signal source.*

Parts List

R (x)	1/4–1/2 W carbon resistors
R4	5 k linear pot (*RS 271-1714)
C1, C3, C4	0.01 µF disc ceramic (RS 272-131)
C2, C5	47 µF 16–35 V (RS 272-1027)
C6	1000 pF disc ceramic
C7	4–18 pF ceramic trimmer
BR	bridge rectifier (RS 276-1161)
D1	1N4001 diode (RS 276-1101)
D2	1N34 point contact diode (RS 276-1123)
Reg	LM317 voltage regulator (RS 276-1778)
F	1/4 A fuse (RS 270-1002)
T	12.6 V 300 mA (RS 273-1385)
LED	red LED (RS 276-041)
Single-sided circuit board	any thickness

*RS = Radio Shack part numbers

Table 2. *Parts list.*

as seen in **Table 2**. The oscillator portion may be built up from discrete parts or a channel element may be used if available. Transistors for the oscillator may be almost any device available, but I've freely substituted the 2N4401 and 2N4403 for the Motorola-part-numbered devices indicated.

Some experimentation may be required to achieve proper operation following part substitution. In any case, the signal source may be constructed to cover either the 144–225 MHz or 450 MHz band using one oscillator design and selecting the desired resonator for the band of choice.

Layout of the circuit and stripline resonator is not critical as long as the stripline is mechanically close to the oscillator's output and is kept free of dangling wires. I constructed my project on a piece of single-sided circuit board with copper on the top side so that I could see the resonator. Yes, the resonator could be on the underside of the board as long as the board is supported a minimum of one-quarter-inch from a metal surface.

Although it is my usual practice to etch circuit boards, for this project I used a dental burr to rout out the resonator and circuit pads for the power supply. The final results are the same, but the appearance of the routed board isn't quite as nice. When using the routing technique it is necessary only to isolate a copper pad from the rest of the copper plane. The pad is used as a tie point for a component lead. When completed, the finished board appears to remain intact but has small islands for attaching component leads. Long traces can be routed as well, to save placing jumpers on the board.

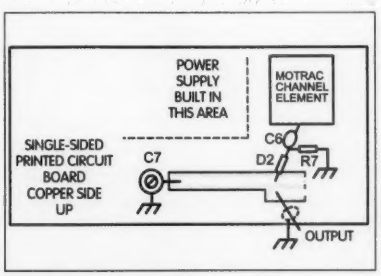

Fig. 5. Circuit board and stripline.

Following completion of the mechanical construction, it is necessary to test and adjust the device. The first step is to use an ohmmeter to check various component pads and traces to make sure there are no shorts to the copper ground plane. The second step is to apply power, assuming that all components are properly oriented, and verify variable control of the oscillator's supply voltage. Set the voltage control to approximately 12–13 V.

With a receiver tuned to the frequency desired from the signal source, adjust the frequency set capacitor for center channel. Then adjust the capacitor C7 for maximum signal amplitude into the receiver. It may be necessary to lower the signal amplitude to "observe" a peak setting of C7.

Upon completion of the tuneup operation, the signal source is ready to use. Vary the output amplitude control and observe the pot position for a minimum detectable signal. You might expect that amplitude to be in the range of 0.1–0.5 µV when using a recent-model ham mobile transceiver. As I did, you'll gain a "feel" for the relative sensitivity of one receiver versus another after using the signal source a few times.

Even though this VHF/UHF signal source project is simple and noncritical to build, it does add a needed dimension to your inventory of test equipment. 73

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Larry Antonuk WB9RRT
P.O. Box 452
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Our local ham club, bitten by the foxhunting bug, had a hunt the last Sunday of each month. I had been teaming up with a couple of my buddies, and the three of us were having a great time honing our foxhunting techniques and tweaking our equipment. We'd constructed several different antenna setups for on-foot and vehicular tracking. After the first few hunts, however, we had to acknowledge a major deficiency in our foxhunting tools. We were using lousy receivers.

When a transceiver just isn't good enough

Actually, the receivers we had weren't what you would normally consider lousy. They were practically top-of-the-line handhelds, manufactured by a couple of the leading ham radio manufacturers. They had more bells and whistles than we knew what to do with. The problem was, they just weren't suitable for serious foxhunting, because of their lack of shielding and poor selectivity.

For example, one of the hunts went quite well until the final half-mile. Once we closed in on the fox it became impossible to get a clear bearing. It seemed like the fox was all over the place. As it turned out, the fox had been hidden in the vicinity of a commercial FM broadcast tower. The FM station simply overloaded the front ends of our little handhelds, since they had little or nothing in the way of front-end selectivity, and slightly less than average IF selectivity. (This situation turned out to be more of a fortunate mistake by the fox hider than a carefully-planned smokescreen, but the result was the same.) We've had similar situations on hilltop repeater sites. There's so much RF, the poor handheld doesn't know what to do.

Another drawback to the hand-held radios was the lack of shielding. Once you get fairly close to the fox with a handheld you find that no amount of attenuation will knock down the signal. You can even disconnect the antenna and hear the fox full quieting. This occurs because the RF signal passes right into the front end of the handheld, bypassing the antenna jack. Most handhelds don't contain enough metal to melt down into a bottle cap. This fact becomes obvious when you're in the presence of a strong RF field. Some foxhunters circumvent this problem with the use of an "active attenuator" or variable mixer circuit. However, we found these to be less than desirable because they can actually retransmit the fox signal, creating a situation where the hunters are hunting each other rather than the fox. In addition, some active attenuator designs actually create signals that land outside the ham bands—not a good thing! We felt that a high-selectivity well-shielded receiver would be a better solution.

In addition to selectivity and shielding, our third requirement was fairly straightforward. One of our team was charged with the task of rotating a six-element beam in the back of the pickup as we sped down the highway. He found he had to hold his handheld in one hand in order to see the teeny bar graph signal strength display. His vote was for something with a large, easy-to-see signal strength meter.

Making the selection

Finding the radio was easier than we thought because so many choices were automatically eliminated. Our first thought was to look over all the current mobile rigs offered by the major ham manufacturers. We did this, but found that all of them were synthesized. This would be a good thing in and of itself, but in the case of mobile rigs, synthesized also meant that they had front ends as wide as a barn door. We looked into some older used commercial rigs. These were great in the shielding and selectivity department, but used crystals.

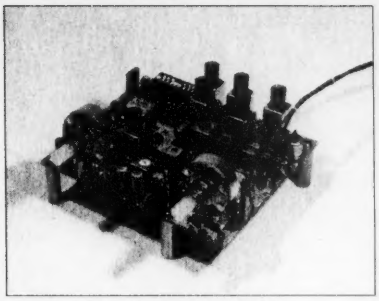

Photo A. *The Hamtronics R301.*

We felt that some sort of frequency agility was important. Our foxhunts all occurred on the same frequency, but what about the possibility of RDFing a jammer or lost hiker? It didn't make sense to have to switch gear when the chips were down.

One evening, as we were going over the possibilities, one of my buddies suggested Hamtronics. We had used their receiver and exciter modules in the past in some repeater applications and knew they were rock solid. My friend had heard that they now had a synthesized version of their classic R100 and R144 receivers. I thought this was great and said I'd get on the phone the next morning and get the info and catalog. My friend gave me that "did you just fall off the turnip truck?" look and led me into his ham shack. He pulled up the Hamtronics Web page, and in about a minute we were looking at a spec sheet and description of the new Hamtronics R301. (Sometimes I think I should have been born during the spark gap era.)

Checking it out

The R301 is billed as the seventh generation in the line of Hamtronics receivers. Like its predecessors, the R301 comes in several models. Four models cover segments of the range from 139.000 to 174.635 MHz, and a fifth model covers 216.000 to 226.235 MHz. (I understand that UHF versions will also be available soon! I can hardly wait!) In many ways, it's similar to the R100 and R144 receivers: about 4 x 4 inches, high quality double-sided PC board with ground plane, triple-tuned front end, and high quality crystal and ceramic IF filters. The IF selectivity is >100 dB down at ±12 kHz. It's got a 12 dB SINAD rating of 0.15 µV, and an audio power output of 1 W continuous/2 W peak (another good thing when you're in the back of a pickup at 60 mph). One thing the R301 has which the older rigs lack is an onboard computer.

Well, actually a microcontroller. The R301 uses a microcontroller to set the frequency of the receiver. Working in conjunction with a phase-lock loop synthesizer chip, the microcontroller reads the frequency programming switches and steers the PLL to the proper operating frequency. This means that the frequency can be changed by flipping a few switches (and retuning the rig if the new frequency is farther than about 1 MHz from the old frequency). The PLL is referenced to a fixed frequency standard, which is in the form of a crystal on the ±5 ppm model, and takes the form of a temperature-compensated crystal oscillator module (TXCO) on the ±2 ppm model. We didn't feel we needed the extra frequency stability of the ±2 ppm model, but the operating temperature was greater (-30° to +60° C vs. room temp ±10° C for the ±5 ppm model) so we opted for the high stability model. (Apparently it gets pretty cool in the back of that pickup truck.)

The next morning, instead of ordering a catalog, I got on the phone and ordered the R301. The UPS truck showed up two days later.

Putting it together

The Hamtronics gear ordered in the past had all come in kit form. This time, however, we went with a preassembled unit, mainly because we felt we would need to spend some time and effort getting the R301 into a suitable enclosure and building up an option or two. We felt it was important to spend as much time as possible foxhunting rather than building.

If you feel like building, however, the manual and instructions are the usual quality from Hamtronics—very clear, with plenty of troubleshooting and modification tips. The only unusual part used in the radio is a surface-mount

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PLL chip. This is a 20-pin device that mounts on the underside of the PC board. (This and other magazines have published many articles on how to use SMDs. It's not a difficult process, but you may want to get some guidance if this is your first SMD project.)

Another advantage of ordering the factory-built unit is that it comes with the TXCO as standard equipment. With the kit, the TXCO is an option, which adds $40 to the cost. Once I decided to go with the TXCO option, buying the factory-built unit became even more attractive.

Frequency selection

Setting the frequency on the R301 is pretty straightforward: it is set using ten DIP switches. A jumper is also used if there is a major change in band segments. All frequencies are based on a base frequency, and each switch is weighted with a frequency value. Simply put, the base frequency plus the weight of each flipped switch equals the operating frequency. The manual gives a step-by-step description of the process.

The microcontroller on the R301 monitors the DIP switches continuously, so you don't need to reset or power down the radio to set the new frequency—it happens immediately. This would make it easy to set up different frequencies with a series of diodes and some switches, or some other remote tuning device. (So many potential modifications, so little time!)

Tuneup

Once the frequency is programmed, the receiver can be aligned to the new frequency. In most cases, the change in frequency will be less than one MHz, so retuning isn't necessary. Just change the DIP switches.

However, the sharp tuned circuits used in this design should be optimized if you want to tune farther than about one MHz from where the unit was peaked previously. This will mean only a tweaking of the VCO and the front end coils, which can be done by monitoring simple DC test points with an on-the-air signal.

Large frequency excursions will require a complete tuneup, which is only slightly more complex. Tuning requires only a sensitive voltmeter and a signal generator.

Gilding the lily

Our enhancements to the R301 were fairly simple and don't deserve much mention. We wound up mounting the unit in a cast aluminum box, supplemented with finger stock for better RF sealing of the top cover. The power, audio, and signal strength lines were fed out of the cabinet via feedthrough capacitors, inline filters, and ferrite beads. The R301 doesn't use a chip that gives an actual S-meter reading; however, a test point is available that gives a signal strength value that is based on the noise level seen in the squelch circuit. This level varies from about -0.5 to 0.75 volts. This level was passed into a circuit utilizing an LM3914 LED driver, connected to 10 high-intensity LEDs. These were mounted on a box separate from the R301's cabinet, to make it easier for the operator of the beam to set the indicator box wherever it was convenient. (Details on the receiver cabinet shielding and signal strength meter can be found in the book *Transmitter Hunting — Radio Direction Finding Simplified,* by Curlee and Moell, published by TAB Books.)

At the time of this writing, the R301 has yet to be tested under actual battlefield conditions, as the next hunt is still a few weeks away. However, preliminary tests indicate that the improved selectivity and shielding will make a marked improvement in our hunting ability. We now have a main receiver that is highly selective, is much more RF immune than anything we've used previously, and has a signal strength meter that can be read from 10 feet away. It may not propel us into the IARU ARDF World Championships, but we plan to be the team to beat in this neck of the woods.

The R301 synthesized VHF receiver is available from Hamtronics, Inc., 65-D Moul Road, Hilton NY 14468-9535. A companion T301 synthesized exciter is also available. Check out the catalog at: [www.hamtronics.com]; E-mail: [jv@hamtronics.com]; or phone (716) 392-9430 for a complete catalog. Price class: $139 kit, $209 factory-built (note: factory-built includes TCXO option). 73

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And the (Zero) Beat Goes On ...

More on the Fessenden Fenomenon.

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It begins on a peaceful Sunday afternoon dedicated to building that two-meter quad I've always wanted. But in that inexplicable way that smoke sometimes starts curling out of your power supply, the tranquillity of the day unexpectedly erupts into a volcano of gastric torment.

A memory of unhappy revelations comes flooding back. It was a rite of passage, that time in our youth when we were forced to confront the unrelenting desecration of our myths and heroes.

No, Jim, there is no Santa Claus. It's all been a well-intentioned joke.

And by the way, Jim, Christopher Columbus didn't discover America, either. Chris was aced out by Leif Ericsson and his grim band of victorious Vikings some 500 years earlier.

Willy Shakespeare? He didn't really write all those wonderful plays, Jim. They actually were written by someone else with the same name.

And yes, Babe Ruth did hit all those home runs. But, if the truth be known, the fields were smaller then.

O tempora! O mores! The inhumanity of it all!

What lemming-like perversity drives us to assault our own heroes? I wonder.

But I digress.

Let's get back to the two-meter quad.

Naturally, I had resorted to my back issues of *73*, where I'd vaguely recalled having seen such a how-to article sometime in the past. I went through the pile in the garage workshop and found it in the July 1996 issue.

That's when it happened.

While riffling through the pages looking for the article, I was suddenly and cataclysmically hit again with the triple whammy, the full monty of radiodom, as it were.

It's there, on page 40. How could I have missed it just two short years ago?

"Just Who *Did* Invent Radio?" an article by Glen Zook W5UOJ asks. I sense mischief in the title.

It is more than just a title. It is a dare. A challenge. A cold, wake-up slap.

"Is there any doubt?" I ask out loud, bristling. "There is none," I reply to myself. I recoil, knowing what's coming.

Mr. Zook is out to unseat Guglielmo Marconi.

The unholy *jihad* against our heroes, the assault I thought was over, is continuing.

With quivering lip, I force myself to read—and I read it through to the end, disbelieving.

"Enough! Take that back, Mr. Zook!" I say it petulantly. I look around hoping that no one has heard me talking to myself in the quiet of the garage.

It is a short, tight article focusing more on the conclusiveness of patent litigation than hard scientific evidence. In it I am invited to believe that Marconi's claim to fame as *Numero Uno* has been displaced by a certain obscure Canadian professor by the name of Fessenden.

Fessenden. Reginald Fessenden, that is.

Now, being Canadian myself, by birth, and Italian by heritage, I'm in big trouble here. You can imagine the inner turmoil, the kaleidoscopic confusion, as one half of me tries to push the other half off the pedestal, the id and the ego slugging it out in mortal combat. It's a real king-of-the-mountain contest, a psychic dust-up.

I reach for the bottle of Maalox® on my workbench.

The Fessenden Fenomenon had always been around, but lay dormant until resurfacing again in 1966. Ormond

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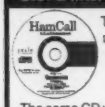

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Raby, a Toronto writer, put out a biography detailing the professor's life.

Fessenden was born in Quebec, raised and educated in southern Ontario, and taught at the University of Western Ontario in London, Ontario, before moving to Boston where he pursued a distinguished career as a teacher and inventor.

Raby portrays Fessenden as an unrecognized genius, a *wunderkind,* who—if we are to accept even a smidgeon of what is attributed to him—makes the achievements of Marconi and his contemporaries seem puny by comparison.

Raby credits him with no less than 500 inventions, not the least of which was radio, even though it was just sort of a sideline.

Mr. Zook asserts in his article that, "By the mid-1890s, Fessenden was (already) transmitting ... from the shore to people aboard pleasure boats on the St. Lawrence River."

Now we must remember that during this time frame, while the good professor was entertaining his acquaintances in this lively manner, Marconi was still trying to jump a spark across a small room, then across a field, then between buildings. All with the help and support of some of the best brains around.

If only Marconi had heard, at the time, about Fessenden's feats, he could have saved himself a lot of wasted time thrashing about with coils, condensers, and coherers. Because, you see, by now Fessenden was already way past spark-gap primitivism. (Are you ready for this?) He was actually transmitting, not just Morse, but voice and music to those people out there on their yachts. Out on the St. Lawrence River.

It is useful to recall that in the mid-1890s, while Fessenden was purportedly entertaining his yachting friends in this manner, Sir William Preece had established himself as one of the preeminent world leaders in the field. Dividing his time between research into induction technology and managing the entire British telegraph system, he was in contact with most, if not all, the researchers of his day, in both his capacities. It is not unreasonable to assume that he was well aware of developments on both sides of the Atlantic, particularly in his position as head of the telegraph system.

Yet when the 22-year-old Marconi showed up at his London office in 1896, Preece was so impressed with what Marconi presented that he immediately threw his full support behind the young inventor, providing him with personnel, equipment, and encouragement, and arranging financing.

Meanwhile, Fessenden's accomplishments, radiowise, were, apparently, far from over.

We are told that later, on December 23, 1900, to be exact, he stunned his detractors "by successfully transmitting the sound of the human voice between two 50-foot towers on Cobb Island in the middle of the Potomac River near Washington." Tne towers were 1.6 kilometers apart.

Now, why he would need to demonstrate formally that he could transmit voice for about a mile when he had already performed the more spectacular feat of transmitting to his yacht-bound friends out on the St. Lawrence, we are not told.

Without meaning to sound quarrelsome, I suggest that scientific feats generally progress from the lesser to the greater, not the other way around. I learned to build a mean crystal set before I ever tackled my first QRP rig, a Heathkit H-6. But, again, I digress.

While Fessenden is performing this feat, Marconi and his supporters by now are working relentlessly on the windy rocks of Signal Hill near St.

John's, Newfoundland. They are hoping desperately to receive a few little sparks that are trying to pole-vault the Atlantic.

It is such a modest, basic goal compared to what Fessenden is already doing, isn't it? All Marconi aspires to is a simple, one-way Morse transmission.

A year would pass before Marconi succeeded, a whole year before those three raspy dots made their way through the magnetic storms, static, and ether to reach him in Newfoundland from Poldhu, Cornwall, in England.

The rest, as they say, is history.

But for Fessenden, still apparently unrecognized and unheralded, the best is yet to come.

Six years later, in 1906, with Marconi's spark-gap technology by now quite well developed and in place, and the airwaves fairly crackling with primitive Morse messages, The Great Fessenden performs his most outstanding feat.

Are you sitting down?

On Christmas Eve, 1906, we are told, he broadcast voice and music to ships in the Caribbean from his station at Brant Rock, Massachusetts. The banana fleet ships of the United Fruit Company were treated that night to the professor playing "Silent Night" on his violin, as well as recorded music.

They were separated by 1600 kilometers.

Now that beats poor old Marconi's pitiful dots and dashes, doesn't it?

Yet another account of the same event says that Fessenden "delighted listeners up and down the East Coast by broadcasting voice and music from his transmitter at Brant Rock using a high-frequency alternator based on Tesla's designs and principles."

The first account, no doubt recognizing that there is a slight *non sequitur* problem here with the receivers, allows that the ships must have had Fessenden's special receivers installed in them. The other version leaves us to wonder what receivers those people up and down the East Coast were using.

Presumably, receivers capable of receiving the professor's voice and music were not in general usage up and down the East Coast. But that could be

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because they hadn't been invented yet. Unless, of course, the professor had gone around like Johnny Appleseed, distributing and installing his them up and down the East Coast of the United States.

This version also suggests that the voice and music were being received over the relatively primitive spark-gap equipment.

"Radio operators on ships in the Atlantic were shocked to hear a human voice emitting from the equipment they used to receive Morse code. Many operators called their captains to the radio room where they heard Fessenden make a short speech, play a record and give a rendition of 'O Holy Night' on his violin."

This, of course, is possible.

I distinctly recall on one or two occasions receiving voice at the far edge of the dial on my little Heathkit QRP rig. And people have been known to receive radio broadcasts through the fillings in their teeth, after all.

At this point we have to ask ourselves whether this might be one of those urban legends that grows with each telling, like the alligators in the New York sewer.

Too many things just don't zero-beat. Let's examine a few.

Marconi's successes with Hertzian waves were incremental, progressing bit by bit with each improvement in his equipment. His work was monitored by many supporters and under scrutiny by more than just a few enemies. But when he succeeded in jumping the three dots across the Atlantic—December 12, 1901, wasn't it?—the world literally and figuratively gasped. It was big news to an incredulous public. The impossible had been done.

It was comparable, in its effect on the public, to the news of the first Moon landing in the '60s.

According to one account, "The press of the world went mad. Pages were filled with jubilation, disbelief, triumph. 'Wireless' was on everyone's tongue ..."

That the undersea cable companies despaired at the news and immediately mounted their counteroffensive should tell us something. They had been monitoring the situation closely, for financial reasons. Why hadn't Fessenden's feats provoked the same reaction?

Unless we are to believe that Marconi's public relations skills were as advanced as his research.

Yet here is the goodly professor Fessenden doing far greater things with voice and music, just a few hundred miles away, in an area far more populated than the eastern cliffs of Newfoundland.

And no one knows about it.

No, that's not quite true, because there were those people on the yachts in the St. Lawrence, the sailors on the banana boats in the Caribbean, and the people up and down the East Coast. They would know about it. They were, after all, the recipients of the transmissions. But I guess they didn't care about it. It didn't make much of an impression. It was nothing. Just one of the professor's funny little gadgets.

For certain they couldn't have bothered to tell anyone else about it.

Give us a break, please.

Why would Marconi's three little dots cause such a kerfuffle and Fessenden's airwaves' violin sonata be ignored? Unless it didn't happen, perhaps?

Now, as history goes, all these things happened just the day before yesterday, relatively speaking. A hundred years ago more or less. Just like Marconi's equipment, Fessenden's equipment must still be around, in museums, in universities, in the attic—somewhere.

The proof of the pudding, as grandpa used to tell grandma, is not in the telling, but in the eating.

So, too, the proof of Fessenden having outdistanced Marconi must have been in the doing. Get out the equipment and demonstrate two things: (1) that its design and construction predated Marconi's accomplishments; and (2) that it works.

The equipment is no longer available? Every scientist leaves papers, notes, detailed plans. Get them. Build it. Do the same thing.

Zook and other writers hint that Fessenden's work was suppressed and Marconi's made to flourish because of sinister commercial forces. That notion, however, is not consistent with the proposition that commerce will tend to support the earlier, better product. Investors, after all, (dare I utter it?) hope to make money.

True, Marconi was very commerce-oriented, but it was that same commerce that ultimately supported and advanced his science. Which is as it should be. We are led to believe that Marconi's science was somehow tainted because it was commercially driven. Try telling that to Bill Gates.

This resurrection of Reggie Fessenden and his misty deeds has a curiously stunning parallel in the field of aviation.

Did you know that a full two years, four months, and three days before the Wright brothers flew at Kitty Hawk, another person had already beat them to it?

No, it was not some obscure Russian whose unsubstantiated claim is based on Cold War revisionism, but a real live American resident.

His name was Gustave Whitehead. He was a German immigrant living and working in the United States of America. He did it at dawn on August 14, 1901, near Bridgeport, Connecticut. It is well documented. It was in a heavier-than-air, power-driven airplane of his own making. He took off from a level runway. He made four flights that day.

As with Fessenden, Whitehead's accomplishment was also purportedly suppressed by commercial interests supporting the Wright brothers. It is alleged that the Smithsonian Museum has been party to that suppression.

Don't believe me?

Go to Web site [http://www.deepsky.com/firstflight/] and read for yourself about Gustave Whitehead and the Smithsonian Conspiracy.

Perhaps he and Fessenden, victims both, now commiserate with each other in the great beyond.

So, Mr. Marconi, you can take comfort. You are safe. Your record stands. It's not as if usurpers haven't come along before. They've always been there, perhaps always will be.

Meanwhile, I still have a two-meter quad that needs building.

James Fontana is currently working on a novel based on the life of Guglielmo Marconi. 73

The Evolution of Power Supplies

continued from page 14

wave, fast voltage transitions were created which were transferred to the secondary as spike voltages having a very high amplitude.

A buffer capacitor was required across the secondary winding to roll off the spike in order to smooth the output. To simplify the concept of operation, pulse dampening resistors and spark suppression capacitors used with vibrators were intentionally omitted from the schematic shown in **Fig. 4**. The spikes were always a noise source requiring correction, and they were particularly troublesome for hams operating in the 10-meter band.

Poor contact reliability with single contact configurations created the development of dual-contact vibrators, which resolved some of the contact burning and erosion problems that were inherent with single-contact ones. The vibrator contacts were alternating switches which caused current to flow in alternate halves of the primary winding in a manner similar to a push-pull action. Having a large switch contact surface, the vibrator contact provided full battery voltage to each half of the transformer winding.

Many radio old-timers will remember rectifiers such as the 0Z4, 6X5, and 6X4 that were used in the early radios. The 0Z4 was a gas-filled dual-diode tube without a filament that gave off a bluish-purple glow when it was operating. The sharp eye of the technician was able to detect potentially defective 0Z4s, when the color would begin to change to a yellow-red, and/or when the glow began to flicker.

Between 0Z4 and vibrator contact problems, technicians were kept quite busy repairing vibrator supplies. In later years, many vibrator power supplies were improved by replacing the 0Z4 with solid state diodes, and eventually the vibrator was changed to a pair of transistors operating as saturated switches that plugged into the vibrator socket. The transistorized device was called a vibrator substitute.

Power supplies are an interesting subject, and the study of the changes to them provides a lot of insight into the significance of the various designs that have been around from the very earliest days of radio. On the surface, it would appear that the changes have been small or insignificant, but consider the changes that have been instituted as a result of technological developments, and to meet the many faceted needs of ham radio.

In Part 1, our discussion has involved primarily dynamotors and vibrators which were used in mobile power supplies. Part 2 will continue with the subject of power supplies and will involve switching power supplies that are a takeoff from the vibrator supply concept. Switching power supplies are used in many applications, including home computers and mobile radio systems. I hope that the theory and schematic diagrams included will provide you with some of the many clues that are needed to troubleshoot and repair switching power supplies. 73

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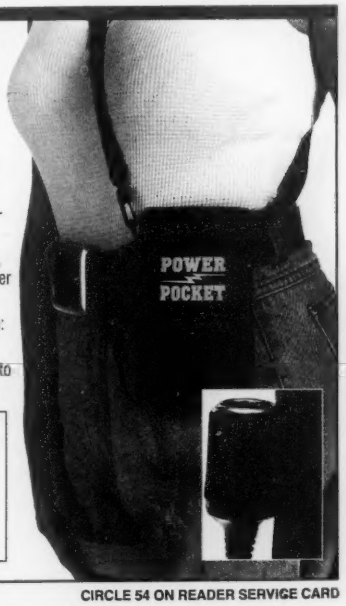

CIRCLE 54 ON READER SERVICE CARD

George's XE-lent Adventure

Part 1: Days 1–9.

George Pataki WB2AQC
84-47 Kendrick Place
Jamaica NY 11432

Usually, when I visit the amateurs in a foreign country I go around to various cities to see as many hams as I can. During my recent trip, with one exception, I stayed only in a single place: Mexico City, which with its 20 million inhabitants is as big as many other entire countries. Mexico is very large, so going from one major city to another requires long travel. And even after taking such a trip you may find only one or two active amateurs, so it might not be worth it.

Preparing for the trip

Long before my trip, I wrote a letter to the *Federacion Mexicana de Radio Experimentadores* asking for their cooperation in finding active hams. I guessed that I wouldn't get any answer, and I was right. I wrote them anyway as a matter of courtesy, wishing that this might be reciprocated.

I also wrote a similar letter to Luis XE1L, whom I had once met by chance for about 30 seconds in Dayton. Luis was very cordial and helpful, and in exchanging a bunch of E-mails before the trip he gave me lots of valuable information. During my stay in Mexico City, he also helped me locate several known DXers.

I took with me a two-meter HT and tried to find amateurs by contacting them, but this was a failure because virtually all Mexican repeaters need a tone to open them—and my HT does not have such a capability.

Sunday

My friend Mike AB2DP and I took an early-morning flight from La Guardia airport in New York City, changed planes in Dallas/Ft.Worth, and arrived in Mexico City in the early afternoon. We changed some money at the airport (8.33 pesos for the dollar). I called up Luis XE1L (**Photo A**) and he advised us what to do. At the taxi service booth we gave the name of a hotel, prepaid the fare (86 pesos), and received a ticket which we then gave to one of the many drivers waiting outside the terminal. This is a safe way to travel, although there have been instances when foreigners have been robbed by taxi drivers and their accomplices.

The taxi took us to a hotel in an exclusive neighborhood. I again called up Luis XE1L, telling him that we were all right, and then I called up Theodoro XE1YQQ, a Romanian expatriate, who came to the hotel to meet us with his wife, Rosa XE1YQR.

A short time later, we got a call from Luis XE1L, who was in front of our hotel with his family. We all went down to meet them, and then later Theodoro took us to their house to show us their station. Theodoro and Rosa own a large hardware store. They were licensed in 1995 and love amateur radio, and both have over 100 countries confirmed. Their son Leon XE1YQS is busy with high school, girls, computer, and guitar (**Photo B**).

On the top of their 60-foot tower, they have a seven-element yagi for 10-15-20 meters, an R7 vertical by

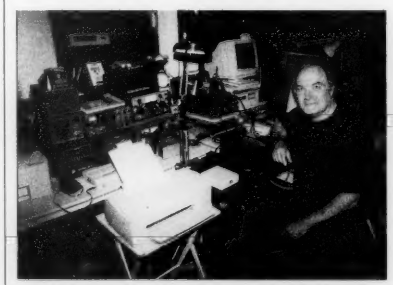

***Photo A.** Luis XE1L uses a six-element yagi on 6 m and an 80-element yagi for 432 MHz for his ATV.*

***Photo B.** Son Leon XE1YQS, mother Rosa XE1YQR, and father Theodoro XE1YQQ are the friendliest radio amateurs in Mexico City.*

Cushcraft, and a longwire for 40 and 80 meters. Theodoro XE1YQQ and Rosa XE1YQR have very nice QSL cards with slogans like "The QSL is the final courtesy of the QSO" and "We are not strangers, just friends who haven't met." I can testify that indeed they are very good friends. Even Leon XE1YQS, who is not very active, has a QSL card.

Next to see was Luis XE1L. Luis is a highly regarded architect, and I saw several houses he designed and built, including his own. Licensed in 1973, he is one of the best-known DXers in Mexico. He has operated from various exotic locations such as Peter I Island 3YØPI; Revillagigedo XF4L; Easter Island XRØY; South Shetland 4K1/XE1L; Martinique FM5/XE1L; Saint Martin FS5/XE1L; Barbados 8P6/XE1L; Mayreau Island FL5/XE1L; 4U1UN; 4U1ITU; 4U1UN/4X4/XE1L, etc.

Luis has a 54-foot tower on his roof which is 20 feet above the ground; on that tower is a seven-element yagi for 10-15-20 meters. A second tower, also 54 feet high and installed on a lower roof, has his three-element yagi for 12-17-30 meters. A third tower, also a 54-footer, carries his six-element yagi for six meters. Other antennas include his 80-element yagi for 70 cm (used for fast scan ATV), and two meter and 70 cm antennas used for satellite communications. He also operates an open repeater on 144.63(-) MHz. Luis XE1L has a very nice QSL card, and his manager is Mary Ann WA3HUP. Luis' E-mail address is: [xe1l@mail.internet.com.mx].

While we were admiring, with increasing envy, his huge station with various pieces of equipment and gadgets, Nellie XE1CI, another of Mexico's real big guns, showed up with her little poodle, "CQ." The poodle understands only Spanish, so you have to call him "See Koo" (**Photo C**).

Mike AB2DP and I later returned to

Continued on page 36

***Photo C.** DXer and DXpeditioner Nellie XE1CI has a poodle named "CQ."*

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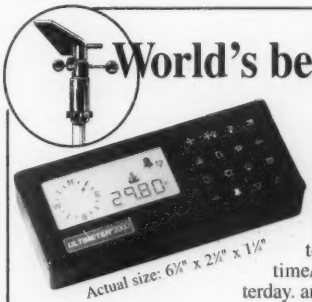

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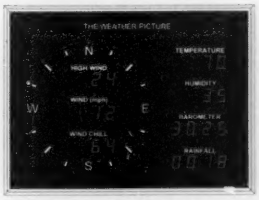

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***Photo D.** Michel XE1MD is a DXer, builder, and experimenter.*

George's XE-lent Adventure

continued from page 35

our hotel, which was expensive and yet did not have air conditioning.

Monday

With the help of Theodoro XE1YQQ and Rosa XE1YQR we moved to a cheaper hotel in one of the business districts of Mexico City, in its historic center. I found out that the prices of many things are negotiable in this country. We got a 20% discount at Hotel Capitol and paid about $25 for a double. The hotel was very nice and quiet, with the window opening to an inside Spanish-type courtyard. The room was hot; it was unusually torrid weather in the country, and even the locals were complaining. Theodoro lent us a small fan which made our life bearable. The hotel has a very good restaurant with reasonable prices.

With Theodoro XE1YQQ and Rosa XE1YQR, with whom we visited almost daily during my 18-day stay, we went to see Michel XE1MD (**Photo D**). Michel, a retired medical doctor, was born in France and came to Mexico in 1962. Licensed in 1979, Michel is very active on the bands and is a good QSLer. He wrote a very interesting book, *El Arte del DX*, which was also published in French with the title *L'Art du DX*.

***Photo E.** Sam XE1ZLW, a medical doctor, is an Honor-Roll DXer.*

Michel XE1MD has a 60-foot tower on the roof, which is 20 feet from the ground. On the tower, he has a five-element yagi for 10-15-20 meters, and an inverted vee for 40 and 80 meters. Michel is also using a magnetic loop type of antenna up to 100 watts, on frequencies continuous from 13.9 to 29.0 MHz. He is a builder, and has a separate little shack for his constructions. He gave me some leads to meet other local hams. Michel is a DXer and is on the Honor Rolls for both phone and mixed, and he does have QSL cards.

Even if the *Federacion Mexicana de Radio Experimentadores* did not answer my letter, we had to pay them a courtesy visit. Around 6:00 p.m., Theodoro XE1YQQ, Rosa XE1YQR and Michel XE1MD took us to their headquarters. There we found Don Ramon, a secretary but not a ham. We saw the QSL bureau, where Jose XE1XOK, Carlos XE1POO, and Virginia were sorting cards. We also saw well-equipped station XE1LM, and their tower with a five-element yagi. However, nobody could find any of their QSL cards.

The Federation, and before that the League, used to publish a bimonthly bulletin *Onda Corta*, but they stopped in 1995.

I bought their latest callbook, issued in 1993 and listing over 8,000 hams. The callbook is not updated, even to the date of publishing; I found several hams licensed in 1990–92, but other people are listed under their callsigns. If you cannot hear many XE calls on the air, it is because most of them are on two meters or inactive. I was told that while the number of hams in most countries is increasing, in Mexico is decreasing, mostly because no new licenses were issued during the last couple of years.

Late in the evening, at the hotel I was awakened by an unsolicited room service with some drinks. Next morning, I was again awakened by an unsolicited wakeup call. At least they knew that we were there.

Tuesday

Mike AB2DP and I went shopping to *Artesanias Ciudadela*, a very large market serving mostly tourists, about seven or eight blocks from our hotel. After hours of walking around, comparing merchandise and prices, I bought nine colorful blankets in various sizes, made of cotton. The ones made of wool were three times more expensive. I was taking them as gifts and I knew the receivers would not know the difference, so I bought the cheaper ones. Curiously, I know that I bought nine pieces—I packed them myself—but when I arrived home there were only eight blankets. I don't even try to figure this out.

For the afternoon, Theodoro XE1YQQ set up a meeting with Sam XE1ZLW, a member of the local club, in a large parking lot of a shopping center in Satelite, a suburb of Mexico City (**Photo E**). Theodoro and Sam did not know each other, and each agreed to recognize the other by the color of the silvery cars both were driving. We went to the parking lot and you wouldn't have believed how many silvery cars there were. Both Sam and we waited about 20 minutes, not far from each other. From time to time Theodoro asked drivers of silvery cars if they were Sam, but nobody wanted to admit to that. Finally, Sam was found and we all went to his house. It seems that most Mexican hams have very nice houses, and Sam is no exception. This is because only members of the upper middle class seem to have the amateur radio hobby. The rest of the country goes for soccer, and that does not require expensive equipment—just strong arms and legs, and a really big mouth.

Sam XE1ZLW was born in Minnesota and brought to Mexico when he was one week old. In 1985, he started as a CBer because his house was damaged during the big earthquake. He moved to a new neighborhood without telephones, and he needed communications. In 1987, Sam got his amateur radio license. He is on the Honor Roll, missing only North Korea. In the same situation are several more of Mexico's big guns: Luis XE1L, Nellie XE1CI, Vic XE1VIC, Fernando XE1AE (and

others around the world). It seems that placing North Korea on the DXCC list, after Romeo's phony adventure and just a very limited token operation, is considered a very controversial decision here.

Sam's tower is 63 feet tall above his roof, which itself is 45 feet from the ground. His house is on high ground with an unobstructed view all around. His 11-element TH11DX Hy-Gain antenna for 10-12-15-17-20 meters and his two-element Hy-Gain antenna for 40 meters also help him breaking the pileups. Sam is using his tower and a wire extension for 80 meters, and with the antenna tuner he can even get up to 160 meters. He is a member of the International DX Association and he is a good QSLer. His E-mail address is: [xe1zlw@supernet.com.mx].

Sam XE1ZLW is the past president of the Satelite city radio club, which now has about 40 members, a callsign, and a nice QSL card for a nonexistent radio station: XE1RCS. Yes, while I met many hams with stations but without QSL cards, here was a club without station but with nice cards. The members meet the last Tuesday of the month, at 9:00 p.m., in a restaurant. After a long discussion, they decided that the meeting place was in a bad neighborhood and we should not go there. This was around 6:00 p.m., and I suspect that Theodoro did not want to wait another three hours until the time of the meeting, so we went home.

Wednesday

Mike AB2DP and I again went sightseeing and shopping in the *Mercado de Curiosidades y Artesanias,* about two blocks from our hotel. I would have said "window shopping" because we did not buy anything, but the place has no windows. There are 167 stalls and the merchandise is all over the place. As you pass through the hallways, the dealers greet you and invite you to see their stuff. Bargaining is the rule of the house. It is relatively easy to push down the original prices 20–25%, but later you will still find the same items for less than you paid. So first just look around; then take notes on the what, where, and how much of the various things you are interested in buying; and then, on the last day or so, do the actual shopping.

The exchange rate is better in the city at various *cambios* than at the airport; we got 8.4 pesos for a dollar. There are no black marketeers or street exchangers as in many other countries.

Thursday

I wrote a bunch of postcards and bought some magnets for my wife. They cost two pesos and come in endless varieties. Of course, I told my wife that they cost much more than they did. As I am crazy for QSL cards, she is even crazier for magnets, and has hundreds of them on two refrigerators and a microwave oven.

I sent the postcards airmail; about 25 days later, they still had not arrived in New York. Probably they went on the long path.

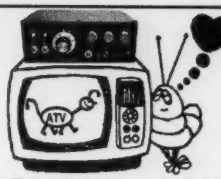
We went to see Carlos XE1GC, an anesthetist still working at age 72. Carlos was licensed in 1976, works mostly SSB, and is a DXer with over 100 countries for his DXCC. He has a three-element yagi for 10-15-20 meters, and a wire dipole for 40 and 80 meters. Carlos XE1GC does have QSL cards.

Beginning in 1970, Carlos maintained radio communications for several sea expeditions on balsa rafts and ships, such as the 1984 voyage of the *Atlantis*. In 1993, he sailed for a month on *Marigalante* as a radio operator.

Friday

Mike AB2DP and I, not having any amateur scheduled to visit, decided to go on a trip. We booked a tour called "Pyramids of Tula and Tepotzotlan." We each paid $35 to a tour operator, and a guide with a microbus picked us up at the hotel at 9:00 a.m. We then went to get another tourist, a guy from Malaysia, and we started the journey. The guide made an offer: For an extra five dollars, he would take us to two extra places not included in the tour. We accepted and paid him.

We visited a few places, the names of which I don't recall and I couldn't even pronounce anyway. We saw an old church in Santa Clara on our way to the Jesuit monastery of Tepotzotlan,



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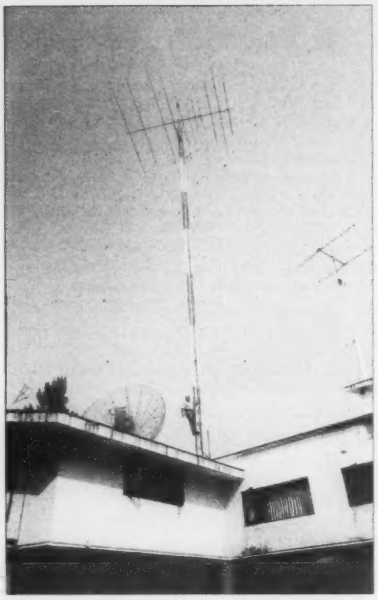

***Photo F.** Cuernavaca's Fernando XE1AE has worked every country on the DXCC list except North Korea.*

built in the 17th century in a Mexican baroque style, with hand-carved altars covered with gold. You are not allowed to use a flash when photographing there, as allegedly it rubs off the gold, so Mike AB2DP ended up using a whole roll of film for indoor shots in the dark interior using outdoor settings. Not even the Holy Ghost will be able to make those photos come out right.

We continued to Tenayuka, to an Indian ceremonial center predating the Aztecs, and then to the archeological site of Tula, about 65 miles from Mexico City. There we saw the pyramids and some large statues of warriors called *"atlantes."* It was a very hot day. Somewhere we stopped for a lunch that was not included in the price of the tour.

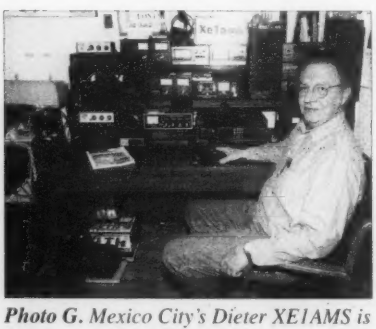

***Photo G.** Mexico City's Dieter XE1AMS is also an Honor-Roll DXer.*

Around 6:00 p.m. we returned to our hotel. On the way, I stopped at an ice-cream-on-a-stick vendor on a street corner. He was offering his beautifully colored stuff as "orange," "mango," "pineapple," and other tropical fruit. I bought a "mango." It was green, but it tasted like nothing. I threw it in the garbage and bought an "orange." It was gorgeous pink, but again it had no flavor at all. Gently I deposited it near the "mango" and bought a "pineapple." This one was a magnificent yellow, but, yes, you guessed it, it had no taste at all. It followed the "mango" and the "orange." And people kept buying them. It would have been nice if they would have called the stuff "green," "orange," "pink," or whatever color they had, instead of calling them what they don't have.

Saturday

Theodoro XE1YQQ and Rosa XE1YQR, who were the best guides I have ever had on any of my trips, took us to Efraim XE1JGM. Efraim is an electromechanical engineer and past president of the *Radio Club Azteca*. Just like Sam XE1ZLW, Efraim got into amateur radio by necessity, in 1986, to keep in touch with friends and family after the 1985 earthquake. He has a very nice station, a tower with good antennas, but he declined my invitation to climb his tower for a photo, even if it was indeed very well anchored.

Efraim's wife Tessy teaches Hebrew in a Jewish school; she was licensed in 1986 as XE1XTN. Despite their very good station with lots of equipment, nowadays both operate mostly on two meters, usually making local contacts. Efraim has QSL cards, while Tessy does not.

Efraim told me that in Mexico you can take the test from the age of 12. There are four categories of licenses but everybody I asked remembered them differently. I believe they are:

Primera (Extra): 1,250 W on HF, 500 W on UHF and VHF.

Segunda (General/Advanced): 500 W on HF, 200 W on UHF and VHF.

Novato (Novice): codeless, not renewable, 150 W on 40 and two meters.

Restringido (Novice): codeless, not renewable, 50 W on 40 and two meters.

In the Mexican callbook I also see another category, *Principiante*, which is probably *Novato*.

In the evening I got a phone call from Fernando XE1AE, who invited us to Cuernavaca, a city about an hour and a half away from Mexico City by car. We also heard from Dieter XE1AMS, right in the capital, and we agreed to visit them both the next day.

Sunday

Mike AB2DP suddenly decided that he had had enough of the heat. He changed his airline tickets and returned to New York. As they say: "If you can't take the heat, get out of the kitchen." Or, get out of the country.

Theodoro XE1YQQ, Rosa XE1YQR, Michel XE1MD, and I left early in the morning for Cuernavaca at the invitation of Fernando XE1AE (**Photo F**). The previous night, I had told Fernando that I prefer to go where there are many hams. He said there were quite a few in his town. Fernando also asked me what time we would be arriving, because he wanted to prepare lunch for us. When we got there, I took his picture on the roof with his 76-foot tower with a TH11DX, 11-element yagi; an inverted vee for 40 and 80 meters; and an 11- + 11-element yagi for two meters. Fernando has 368 countries confirmed and over 500 awards. He also has QSL cards.

Fernando XE1AE was licensed in 1956; he sells and installs radio communications equipment. He is a big guy; I can imagine him selling anything he wants, but I don't see him climbing roofs and towers to install antennas. He is in Cuernavaca only from Friday to Sunday; the rest of the week he is at his home in Mexico City, where he has another radio station.

When I finished my work, we sat down chatting about DX and waiting for the promised lunch, which never materialized. When we asked him about the "many hams in Cuernavaca," Fernando changed his story and said that he did not really know them because he

was only there three days a week. It's happened before, and it happened again. An amateur who wanted to be featured in a magazine lured me with promises and delivered little. OK, no lunch and no other hams.

He kept slapping me on my back and saying: "I like you George, you are a character. I like you, George."

I kept slapping him back and saying: "I like you, too, Fernando, you are a bigger character than anybody I know. I like you, too, Fernando. But I am known to have very poor taste!"

Fernando is in the middle of a long line of Fernandos: his father and grandfather were Fernandos; his son is Fernando XE1FVV, but inactive; even his little grandson is Fernando.

We left Fernando's hungry, and went to see Geoff XE1GE, born in Mexico in 1907 of English parents. Starting in 1928, Geoff was a second operator at X3A; in 1933, he received his own call: X1BG. His license was revoked in 1934 because even though he was born in Mexico, he had no Mexican citizenship. In 1936, Geoff got back his license and used the XE1GL call until 1941, when everybody's license was suspended because of the war. After the war, Geoff came back as XE1GE. He has really kept on being reborn from the ashes.

Geoff XE1GE has a 30-foot tower on the roof, which itself is 15 feet from the ground. He is using a three-element yagi for 10-15-20 meters; a six-element yagi for six meters; a sloper for 17 meters; and three wire dipoles for 20, 40, and 80 meters. Geoff is a builder and experimenter. He works CW and SSB, and FM on two meters. Geoff XE1GE has worked 150 countries, and on six meters alone, over 60. He does have QSL cards and is the only living founder of the *Liga Mexicana de Radio Experimentadores*, established in 1932, which a couple of years ago became the *Federacion Mexicana de Radio Experimentadores*.

On our way back to the capital, we stopped to see Dieter XE1AMS (**Photo G**). Born in Mexico of German parents, Dieter is a business administrator for a digital creations company. He was licensed in 1985. His wife, Claudia XE1MGC, is the director of personnel at La Salle University; she works only on two meters. Dieter has a 60-foot tower, with a 13- + 13-element yagi for two meters and a four-element yagi for 10-15-20-40 meters. He is on the Honor Roll with 330 countries confirmed. His E-mail address is: [xe1ams@mail.internet.com.mx], and he has a nice QSL card.

Monday

I did not have anybody to visit, so again I became a tourist, walking around the city and window shopping. Right near my hotel was a huge computer and electronics complex with about 400 little stores, some of them as small as my walk-in closet. It has five entrances from three different streets. Its shops are open seven days a week, selling and repairing computers, monitors, printers, VCRs, and all such related equipment. As is the local custom, as you walk through the endless halls, the merchants greet you and ask what you are looking for. They have the very latest technology for sale.

Many stores have private security guards, some armed and wearing bulletproof vests, others unarmed. Probably there are more guards than thieves and robbers, but robbing and stealing is still a lucrative business.

They say one man was approached on a dark street by a stranger.

"Good evening, *Señor*. May I ask you for a donation? I have not eaten for days, and I don't have a job or a place to stay. I have nothing except for this knife and this gun."

The man gave generously.

On many street corners in rich residential sections of the city there are guardhouses with security guards checking the visitors. Some apartment buildings and even private houses have their own guards.

After checking out lots of stores, I found the best buys usually out of the tourist paths, where mostly the locals shop. In the big artisans' markets, the first asking price for a colorful T-shirt starts at 50 pesos. It can be bargained down to 40 pesos. The same merchandise is sold on the street for 20 pesos. When you bring this to the attention of the dealers asking 50 pesos, their standard answer is: "a different material." But I checked it out, and the material was the same—only the price was different.

I bought more than 20 T-shirts, a couple of ponchos, an "Aztec calendar" made of wood, and more magnets for my wife. Now we will have to buy a third refrigerator, because there is no more room on the two we have.

Next time: The sojourn continues, or *chili* today, hot *tamale*. 73

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CIRCLE 136 ON READER SERVICE CARD

SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the February issue, we should receive it by Nov. 30. Provide a clear, concise summary of the essential details about your Special Event.

NOV 1

CANTON, OH The Massillon ARC will sponsor "Hamfest 98," Sun., Nov. 1st, at the Stark County Fairgrounds, 305 Wertz Ave. NW, Canton OH. Vendor setup at 6 a.m. Doors open to the public at 8 a.m. General admission $5, $4 in advance. Tables are $10 each. Info and reservations to *MARC, P.O. Box 73, Massillon OH 44648.* Include an SASE. An auction begins at 10 a.m. Talk-in on 147.18(+) rptr. E-mail to *[marc.hamclub@juno.com],* or call *Terry Russ (330) 837-3091 before 10 p.m.*

DES MOINES, IA The Tikva Tracers ARC "Hamfest Iowa '98" will be held at the 4H Building, Iowa State Fairgrounds, in Des Moines. Setup Sat. 6 p.m.–9 p.m., and 6 a.m. Sun. Doors open at 8 a.m. Seminars and "Ask the Experts" will be among the featured goodies. Talk-in on 146.22/.82. Admission $5, first table $10, each additional $8, electric $8. VE exams at 9:30 a.m. Contact *Randal Lees NØLMS, 1575 Northwest 78th St., Clive IA 50325-1255. Tel. (515) 279-4241; E-mail [rclees@raccoon.com].*

NOV 7

ENID, OK The Enid Hamfest Group will hold the Enid Hamfest at Oxford & 4th Streets, at the Garfield County Fairgrounds (Hoover Bldg.), 8 a.m.–5 p.m. Admission $2, tables $1 each. Special features: Free doughnuts and coffee in the morning, free hot dogs and soda at noon. VE exams at 1 p.m. Contact *Tom Worth N5LWT, (580) 233-8473, E-mail [N5LWT@HOTMAIL.COM];* or *Fred Selfridge N5QJX, (580) 242-3551; E-mail [FREDNNEL@IONET.NET].* Talk-in on 147.15(+) or 444.400(+)

SORRENTO, FL A Hamfest, Computer Show and Electronic Expo will be hosted by the Lake ARA, Nov. 7th, at the East Chamber of the Commerce Building in Sorrento FL. Admission $5; vendor cost is $10 (includes one admission). Setup Fri., Nov. 6th, at 3:30 p.m.–6 p.m.; Sat., Nov. 7th, at 6 a.m.–8 a.m. VE exams (walk-ins only) at 10 a.m. For info and table reservations, contact *Chuck Crittendon KA4EXM, P.O. Box 615, Altoona FL 32705. Tel. (352) 669-2075.*

WAUKESHA, WI The Milwaukee Repeater Club will sponsor the 14th annual "6.91 Friendly Fest" on Sat., Nov. 7th, 8 a.m.–1 p.m. at Waukesha County Expo Center Arena Forum, N1 W24848 Northview Rd., Waukesha WI (I-94 to County J, south to FT, west to Expo). Sellers admitted at 5:30 a.m. Tickets $5. 4-foot. tables $5 each. Please call *Mike KB9PHA at (414) 258-4435.* Send an SASE with payment to *The Milwaukee Repeater Club, P.O. Box 2123, Milwaukee WI 53201.* There will be VE exams on-site. Talk-in on 146.91(-) (The Friendly Repeater), and on 146.52. Visit the Club's Web site at *[http://www.execpc.com/~mrc/friendlyfest.htm].*

NOV 8

KAUKAUNA, WI The Fox Cities ARC will present its annual Hamfest at the Starlite Club, corners of Hwy. 55 and Cnty. Rd. JJ. You must buy an admission ticket if you pre-register. Advance admission tickets $4 ea., 8 ft. long tables $8 ea. Send check or money order payable to *FCARC, 1912 Russett Ct., Appleton WI 54914, Attn: Chad Pennings N9PRC, Hamfest Chairman, tel. (920) 993-0485.* Registration for VE exams is 8 a.m.–9 a.m., no walk-ins after 9 a.m. Bring original license plus two copies, and a photo ID. For more exam info contact *Larry Siebers KD9IA, (920) 757-1167.* Talk-in on 146.52 simplex.

NOV 14

MONTGOMERY, AL The Montgomery ARC will host the 1998 Alabama ARRL Convention at the 21st annual Montgomery Hamfest and Computer show in Garrett Coliseum, at the South Alabama State Fairgrounds, located on Federal Drive in the northeastern section of historic Montgomery. Admission $5, free parking, all indoors including the flea market. Flea market setup 3 p.m.–8 p.m. Nov. 13th, and 6 a.m.–8 a.m. Nov. 14th. Doors are open to the public 9 a.m.–3 p.m. CST. VE exams will be conducted on site beginning at 8 a.m. Bring original and a copy of your current license, picture ID, and $4. Talk-in on 146.24/.84, call W4AP. Rag-chew on 146.32/.92 (with phone patch, "up/#down), 147.78/.18, and 449.50/444.50. Flea market reservations are required to ensure tables. For more info, write to *Hamfest Committee, c/o 2141 Edinburgh Drive, Montgomery AL 36116-1313,* or phone *Phil at (334) 272-7980 after 5 p.m. CST. FAX (334) 365-0558; E-mail [wb4ozn@worldnet.att.net].* Visit the Web site for late breaking news and events at *[http://jschool.troyst.edu/~w4ap/].*

NOV 14–15

FT. WAYNE, IN The 26th Annual Fort Wayne Hamfest & Computer Expo, sponsored by the Allen County Amateur Radio Technical Society (ACARTS), will be held at the Allen County War Memorial Coliseum at the corner of Indiana 930 (Coliseum Blvd.) and Parnell Ave. Open to the public 9 a.m.–4 p.m. EST on Sat., Nov. 14th, and 9 a.m.–3 p.m. EST Sun., Nov. 15th. Vendor setup is Fri. eve. and Sat. morning. Admission $5, with no advance ticket sales. Parking is $2. There are over 1100 commercial and flea market tables, all under one roof, containing both new and used radio, computer, and general electronics items. Vendors include several international ham equipment manufacturers. There will be many forums and meetings, VE exams on Sat., and presentations by special guest Gordon West WB6NOA. Shuttle bus service provided to and from commuter airport (Smith Field) and shopping centers. Talk-in on 146.88(-). For more info, leave a message on the answering machine at (219) 483-8163 (tables) or (219) 484-1314 (general info) and you will be contacted. You can also send an SASE to *ACARTS/Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne IN 46851,* or visit the World Wide Web site at *[http:www.pipeline.com/~dagagnon/].*

NOV 15

BENSON, NC The Johnston ARS "JARSFEST 98" will be held at the American Legion Complex, near the I-95 and I-40 intersection. The indoor flea market will be open 8 a.m.–3 p.m. Tailgating 6 a.m.–3 p.m. There will also be VE exams. Contact *Bill Lambert AK4H, 7 p.m.–10 p.m. at (919) 894-3352,* or E-mail *[blambert@interpath.com].* Talk-in on 147.270(+600), 100.0 Hz pl.

NOV 16

ST. PETERSBURG, FL The Pelican Chapter #128 of QCWA will host its 8th Annual Catered Fried Chicken Picnic Nov. 16th, in shelter #13 at Lake Seminole Park, St. Petersburg FL. The time will be from 10:30 a.m. until whenever. Admission is $7.50 per person. The menu is fried chicken with all the trimmings, including dessert and drink. There will be prizes and goodies before the picnic. All QCWA members and guests are invited to attend. Tickets and reservations can be obtained from *Don Bice W4PCO at (813) 347-2707, or the Callbook address.* Talk-in will be on 145.29 (-600), the QCWA rptr.

NOV 20–21

OCEAN SPRINGS, MS On Nov. 20th and 21st, The West Jackson County ARC is holding its annual Hamfest/Swapfest at the Latimer Community Center North of Ocean Springs MS. The hamfest will be open to the general public 5 p.m.–9 p.m. on the 20th, and 8 a.m.–2 p.m. on the 21st. Admission is $2 per adult or $4 for an entire family. The Community Center is located approximately four miles north of

I-10, use exit 50, Ocean Spring MS. Free parking. Self-contained RVs may park overnight. Eight-foot sales/swap tables are $5 each. Advance deposits are required for sales table reservations. Talk-in on 145.110 MHz (-600). The station callsign is N5OS. Contact *Phil Hunsberger W9NZ, 1207 Lancelot Ln., Ocean Springs MS 39564, Tel. (228) 872-1499;* or *Harry McLemore KD4AK, (228) 872-0732.* Correspondence may also be sent to *West Jackson County ARC, Inc., P.O. Box 1822, Ocean Springs MS 39564.*

NOV 28

EVANSVILLE, IN The Evansville ARS and the Ham Station are getting together to present the 6th Annual EARS Evansville Winter Hamfest, which will be held Sat., Nov. 28th, 8 a.m.–2 p.m. Central Time, at Vanderburgh County Fairgrounds Exposition Center. Talk-in on EARS Wide Area Repeater Network 145.150(-)/ 146.925(-) and 443.925(+) Vincennes. [Alternate: EARS repeater 145.110(-).] Use 107.2 CTCSS on all frequencies listed. Free parking. Everything indoors. For table reservations or info, contact *Neil WB9VPG at (812) 479-5741;* or write *EARS, 1506 S. Parker Dr., Evansville IN 47714. E-mail [EARSHAM@aol.com].* The hamfest Web site is at *[http://members.aol.com/earsham/].* Setup begins at 6 a.m. Central Time on Sat.

SPECIAL EVENT STATIONS

OCT 11–NOV 7

MINNEAPOLIS, MN The 1998 Plenipot Meeting, being held Oct. 12th–Nov. 7th, will be accompanied Oct. 11th–Nov. 7th by special event station W98ITU, operating from Minneapolis MN. QSL cards are available from *W98ITU, P.O. Box 131415, St. Paul MN 55113 USA.* Remember to send an SASE. DX cards will be handled directly or through the W9 bureau. Operation will be on all HF bands, CW, phone and RTTY. Novice band operations are also being planned.

NOV 7

WINCHESTER, VA The Shenandoah Valley ARC will celebrate their 50th Anniversary by operating Special Event Station W4RKC on Nov. 7th, 1400Z–2000Z. Club members will operate the station on 14.335 MHz, 28.335 MHz, and 146.820 MHz. Stations contacting W4RKC may request a special 50th Anniversary QSL card by writing to *SVARC, P.O. Box 139, Winchester VA 22604 USA.*

NOV 14

PAXTON, FL To celebrate Heritage Day, ARS K4QBH wi! be operating in the General portions of the 40, 20, and 15 meter bands from one mile away from the highest point in the state at 342 feet. For QSL, send an SASE to *Bill McRae K4QBH, PO Box 503, Paxton FL 32538.*

NOV 14–NOV 15

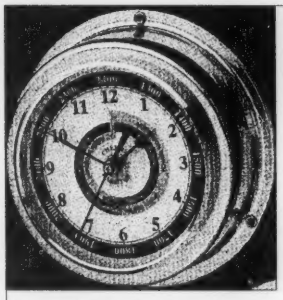
ALEXANDRIA, MN The Runestone ARC of Alexandria MN will operate WØW 1600 UTC Nov. 14th–1600 UTC Nov. 15th, to celebrate the 100th Anniversary of the finding of the Runestone (Birthplace of America). Operation will be on 7.250, 14.250, 21.350 and 28.450 MHz. Stations contacted may request a certificate. To QSL, send name and address to *WAØVVM Runestone Radio Club, 2301 S Le Homme Dieu Drive, Alexandria MN 56308.*

DEC 11–12

BETHLEHEM, IN The Clark County ARC will operate W9WWI, 1500Z Dec. 11th–2200Z Dec. 12th, in celebration of the Christmas season. Operation will be on General 75, 40 and 20 meters. To get a certificate, QSL with an SASE to *CCARC, 1805 E. 8th St., Jeffersonville IN 47130 USA.*

JAN 26–27

ST. LOUIS, MO All Amateur Radio Clubs of St. Louis MO will sponsor Special Event Station WØK during the papal visit of Pope John Paul II, Jan. 26–27, 1999. Operations from the Monsanto Amateur Radio Assn. shack will be on 10–80 meters, 24 hours per day. QSL with #10 SASE via *Rev. Mike Dieckmann KAØIAR, 703 Third St., Hillsboro MO 63050 USA.* 73



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[clhough@pacbell.net]

VHF to microwave preamplifiers

What started all this ruckus was the continuing construction of my 1296 MHz transverter, making improvements on the basic design that was built a few years ago. I am working on a power amplifier stage and getting that circuit up and running. I have to admit that every new project that is started opens up a full avenue of other electronic side paths that have to be addressed in the refining process of completing a rig for high-performance operation. I guess I will always be engaged in making further improvements to circuitry.

The construction of this rig was part of a very ambitious construction project, to put together a rig a month for each of the amateur bands from 1296 MHz to 10 GHz, for our microwave group meetings. I hoped to help spark interest in our other microwave bands.

I have to admit that I will do just about anything to promote interest both in these amateur bands and in construction in general, as both topics offer something to add to our electrical knowledge and to other frequencies' propagation studies. Because of my pure enjoyment of construction, I will try anything useful to our amateur interests in the microwave realm. This extended home-brew construction kind of adds a thrill to the hobby when I'm trying to find inexpensive parts to construct something useful and enjoyable.

As I stated earlier, this project started off with trying to construct a reasonably good GaAsFET preamp for my 1296 MHz transverter. The unit utilized a 1 GHz IF amplifier after the mixer that gave the system lots of gain and a noise figure of something in the 3–4 dB range. Not too bad, but still in need of improvement.

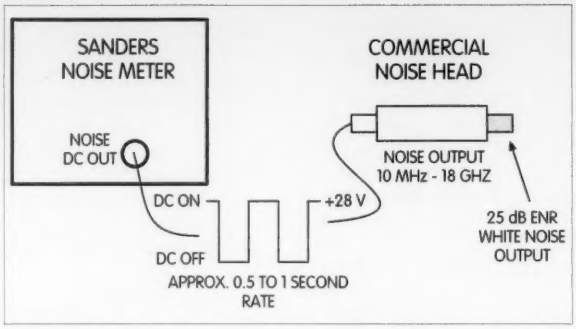

Fig. 1. Basic noise test instrument from Sanders, covering a frequency spectrum of 10 MHz to 18 GHz. Heart of unit is noise head driven by 28-volt power supply.

The instrument used to make these noise figure measurements was a commercial Sanders noise figure meter located in surplus at one of our local swap meets. It has worked very well for me over the years. It's not an HP, but it was what I could find and has served well in helping me to align preamps for best performance (**Photo A**).

The noise figure meter is nothing more than a basic power supply that turns on and off at a pulse rate to turn noise on and off for testing (**Fig. 1**). This circuit can be easily duplicated as nothing more than a toggle switch or push-button to apply power to the noise diode circuit. With a switch, it would be in a manual mode, *vs.* automatically switching on and off at a preset rate, as in the Sanders meter.

What you are looking for, be it manual or automatic, is the maximum change between noise and no noise on your system S-meter or speaker output in an SSB mode of operation. (This test will not work for FM.) What you want to see with noise input to your system is maximum output of noise converted to audio as one measurement. You then turn the noise off and see what the difference is between

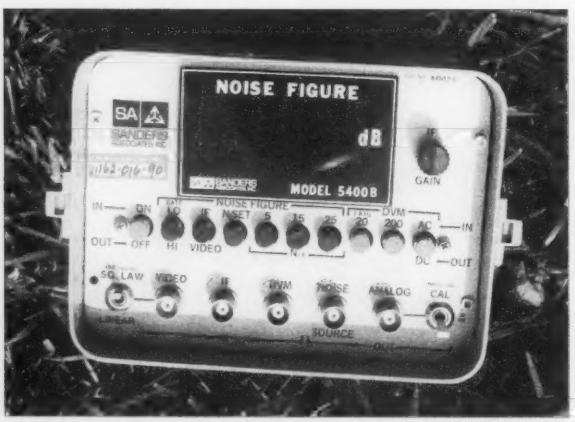

***Photo A.** Sanders noise figure meter, 10 MHz to 18 GHz operation frequency range. Capable of 25 dB excess noise output and can be used with external 10 or 20 dB attenuator to reduce noise for more sensitive systems. With a 20 dB attenuator attached to noise head, this will reduce the noise output to 5 dB ENR (excess noise ratio). Permits noise figure in the 1 to 10 dB range to be measured.*

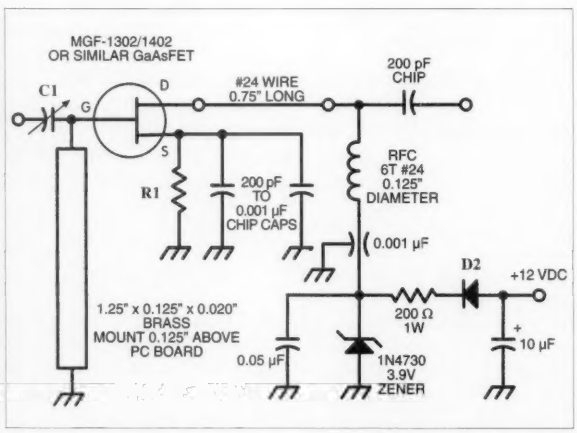

***Fig. 2.** GaAsFET preamplifier by WA5VJB from 1986* ARRL Handbook, *used as test circuit. This circuit selected because of simplistic design, low noise figure, ease of construction, and modest cost. C1 = 0.3- to 3-pF piston trimmer capacitor. R1 = 100 Ω, 1/8 or 1/4 W, carbon. D2 = 1N914 or 1N4148, or any with ratings of 25 PIV and 50 mA or greater.*

noise and no noise. The greater the difference, the better your system is working.

It would be best to know what the noise figure is, but I assure you that if you know you have adjusted your system for greatest difference as stated above, your system is operating as best it can. You may be in the same boat as my 1296 MHz system was before the preamp (5 dB ENR, excess noise ratio) was used for the test. That's the noise head with a 20 dB attenuator to reduce noise to 5 dB excess noise (ENR) as a signal source for test. I saw no change in the S-meter indicator on my SSB receiver when the 5 dB ENR was attached to the 1296 MHz converter, but was able to detect audibly the noise pulses in the radio's speaker.

In essence, the basic receiver converter was somewhat of low sensitivity, with switch losses degrading the system preamp and circuitry. To improve the noise figure, a preamp was constructed to improve receiver sensitivity. The parts and available construction articles were scanned. I found a preamp constructed using a single MGF1302/MGF1402 FET. The circuit was from Kent Britain WA5VJB. He had designed it many years ago, as it was published in the 1986 *ARRL Handbook*. I duplicated the circuit and was quite taken by its simplicity and ease of construction. Don't let it fool you—it is quite a performer for such a simple circuit. See **Fig. 2**.

The input circuit is a strip of thick copper or brass positioned by bending the end of the strip to one-eighth of an inch off the copper circuit board used as a blank substrate to solder parts to. A variable capacitor to adjust for minimum noise figure is placed in series between the stripline and coax connector center conductor to tune to resonance. The gate of the FET ties to the capacitor and stripline and is suspended in air about one-eighth of an inch above the copper PC board substrate by two chip capacitors (200 pF approximate, value not critical). These capacitors are positioned at a slight slant to make the one-eighth-of-an-inch spacing. The FET's source leads are soldered to the two chip capacitors.

The rest of the amplifier circuitry is quite straightforward. Just follow the schematic—the positions of other components are not critical. I mounted the bias resistor on the top source lead to ground. This self-biases the FET. The power supply is a simple voltage dropping resistor and a 3.9 V zener diode feeding the drain via a bypass feedthrough capacitor.

The perimeter of the PC board can be fitted with a small half-inch or so wide strip of PC board to form a cabinet to protect the circuitry. Solder the PC board strip to the outer edge of the main PC board. When the edge is finished, turn it over, and, with the coax connectors pointed up, square off any irregularities in the bottom of the box, making a tight fit when it's placed on a grounded surface. If you desire, the entire box can be screwed with one bolt to your main chassis with the other 1296 MHz converter parts. So much for the test preamplifier.

Diode noise generator

If you have a noise generator, you are ahead of the game; if not, read on—and we will construct a very simple one that will give good results. This will not be highly calibrated but will be sufficient to adjust the preamp used for demonstration purposes. The noise generator is just a diode or transistor base emitter junction of a microwave-type transistor, biased for conduction. The transistor is used as a single diode, making no connection to the collector. In essence it is being sacrificed to utilize its excellent high-frequency microwave specifications.

Most any device will function. Some do better than others. It's a trial that is not difficult. All that is required is a total frequency (F_t) rating of several GHz (the higher, the better). We do not need a power device in this application. The smaller the circuitry design, with minimum lead length, the better the noise source will perform at very high frequencies. Smaller is better.

As such, the generator's construction can take two forms, depending on circuit arrangements. The simplest device is shown in **Fig. 3**. This circuit arrangement applies the driving DC voltage (+24 volts) feeding a current limiting resistor and the noise diode to ground. RF output (noise) is taken from the junction of the resistor and diode with a small-value chip capacitor (10 pF approximate) connected to the small connector center conductor. This circuit, according to Noise Com, a leading manufacturer of noise equipment, is referred to as the "Low Frequency Bias Circuit," good to approximately 4 GHz.

The alternate version is constructed similarly, but the diode junction is connected in a slightly modified circuit. First, the current limiting resistor and diode junction are bypassed to ground with a .001 capacitor and the diode anode is placed in series with a 50 ohm resistor to ground. The output is taken from the junction of the anode and 50 ohm resistor. This circuit arrangement provides better noise output above 4 GHz according to Noise Com literature.

With either noise circuit, the noise diode (or transistor junction) acts like a zener diode current-limited by the resistor and supply voltage. Most noise units run on 24 VDC, making the limiting resistor in the resistance range of 1 kΩ to 10 kΩ. If you are constructing with an unknown device, use a small potentiometer in series with a 1 kΩ limiting resistor to find the best resistance value. Then replace the variable resistor with a fixed resistor.

Connect the noise source to your preamplifier RF input and set the variable resistor to maximum resistance. Apply 24 volts and slowly lower the pot in resistance value for maximum noise. Stop when there is no further noticeable noise output as the variable resistor is lowered in value. Don't rush and go to minimum resistance as with minimum pot—you would burn up the diode if we had not placed a limiting resistor of 1 k in series with the pot for testing. Depending on the diode or transistor you selected for test, current through the device will be in the range of 1 to possibly 10 mA.

If you are fortunate enough to have a noise diode that performs better than expected and produces so much noise that it makes it difficult to adjust to the best noise output, try placing an

Continued on page 44

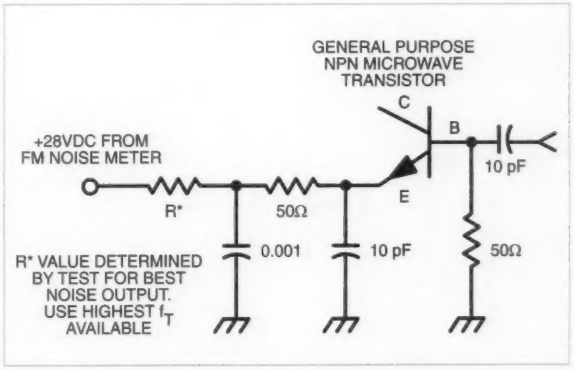

Fig. 3. *Simple home-constructed noise head that produces good results and can be easily reproduced. Circuit is constructed on the back of an SMA or type-N coaxial connector for minimum lead length.*

Hams with class

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Plug with passion

So much of what I'm involved with lately in the promotion of amateur radio in the schools has to do with giving presentations, either as a solo speaker or in conjunction with a club. Many of us who promote amateur radio in public forums need to learn as many good techniques as possible in order to deliver our message most effectively.

A lot of the good speaking habits I've picked up through the years have come about as a result of my membership in a group called "Toastmasters." In this organization, members participate by giving speeches in many different kinds of situations. One of the most helpful articles I've read through this club was written by Melanie Lim and is called "Plug with Passion."

Here are some of the points Melanie stresses when preparing to do a guest presentation at an event. Envision the event. Decide what your goal is for that meeting or event. Then use these tools to help clearly define your strategies.

She recommends that you dare to be different. Letters of invitation are informative, flyers are interesting, but E-mail is much more personal. Traditional and conventional ways of doing things aren't bad, but they can be boring. Sometimes you need to break tradition (not laws) to get attention. Send an E-mail titled, "Get an FCC License" and the message will end up unread, in the trash bin. Try another more imaginative line like, "Learn to Ride the Airwaves for Free" and people will read further.

Embrace energy and excitement. Enthusiasm is contagious. So is the flow of adrenaline. But if you don't have it, you can't pass it on. You can't effectively sell something you really don't believe in. There is no better sales pitch than old-fashioned excitement and energy.

Next, remember to market the memories. Most people don't like to be preached to. For example, they don't want to be told that if they don't attend a particular event, they're going to miss a golden opportunity for information and opportunity. Most folks, however, feel privileged to be invited to participate in history, and they don't mind being pursued with passion for such a momentous occasion. So don't sell the seminar, sell its significance. It's not that people don't want to be part of something "educational"—"unforgettable" just seems more irresistible.

Furnish the facts. Be sure to provide all the facts: the date, time, location, directions, dress code, registration fees, program, and other essential information for the event. Make it easy for people to attend the activity. Anticipate the questions and answer them before they are asked.

Seduce the senses. Don't just publicize your event—romanticize it! Appeal to the senses with your media and publicity efforts. Save the cold, literal facts for a thesis paper and promote your event with style, colorful phrases, and words that conjure up warmth, friendship, excitement, and fun.

Maintain the momentum. Never let up on your efforts to bring in people to the event. Once you become complacent, you may have lost the key to success of the event. People tend to forget, so keep plugging away right up to the last minute with reminders. Strategically placed ads and posters should be

Above & Beyond

continued from page 43

RF attenuator in between the noise head and RF converter. What is happening is that you have a good noise figure to start with and don't need a lot of noise output to see the best adjustment. Just as with a signal generator you reduce the level of the test signal, in this case you reduce the noise output and retest.

On my commercial noise meter manufactured by Sanders, the noise output is rated at 25 dB ENR. This amount of noise is useful in adjusting a numb receiver or one with a poor noise figure by today's standard. For testing on a crystal detector it is top notch, as the noise figure is in the range of 15 to 20 dB. To make a measurement on such a system, high noise is required.

The common practice with noise meters is that when you have a calibrated noise source you have some idea of what range of noise figure you expect to confirm or adjust to. In the case of my Sanders Noise Figure Meter with 25 dB ENR, either a 10 dB or 20 dB attenuator is used to reduce the noise to much lower limits. For example, applying a 25 dB ENR signal to a sensitive system in the 5 dB or less noise figure range is like keying a transmitter next to the receiver.

With a 10 dB attenuator inserted between the noise head and receiver, there were large fluctuations between noise and no noise signals on the receiver S-meter. By inserting a 20 dB attenuator there is still a 2 S-unit difference between noise output and no noise output, making the receiver in the 1 dB or so noise figure range. Not bad for a simple, home-constructed 1296 MHz transverter.

You might need high output if the preamp you constructed is not in proper alignment, or other system problems are giving you poor performance. If that is the case, some repairs are in order to bring the noise figure into better alignment. Just placing a preamp in front of a poor receiver will not always give the results you expect. If your system is working up to snuff then a good preamp will help, but if you have trouble down the line it will just provide marginal performance.

I have started testing many different converters and have found coax relay contacts open and missing center pins in the coax connectors, to mention two problems. Yes, the system worked, but the performance was markedly improved when the defective relay or coax was replaced. Then and only then did a good preamp show its worth. If your system consists of a large chain of relays and coax connectors, make a simple DC continuity test in the receive and transmit cycles of the relay coax cable chain with the converter disconnected.

What test?, you ask. Well, a simple one: Verify DC resistance short from input of the antenna to coax out toward the receiver. That's the center pin continuity of the coaxial circuit. Do the same for the transmit side of the relay chain. Also, verify that the center pins of the cables are not grounded, by making a check between ground and the coax (relay's) center pin of each input circuit. We just want to make sure we are getting minimum loss from the antenna connections and the system.

Well, that's it for this month. Next month I will report on some antennas and tower structure, covering crosscoupling between antennas that you should be aware of. 73, Chuck WB6IGP. 73

HAM TO HAM

Your Input Welcome Here

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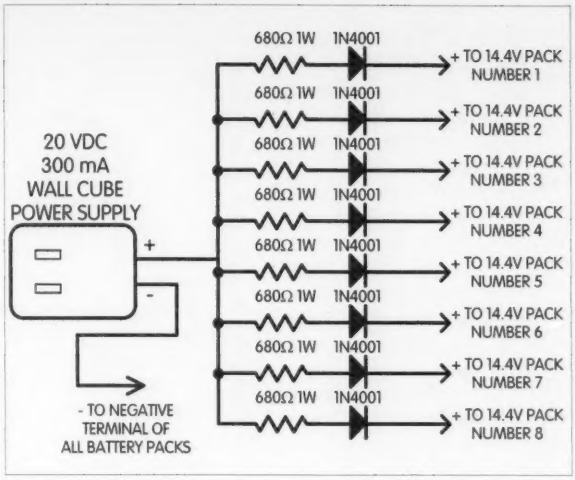
680Ω 1W
1N4001
+ TO 14.4V PACK NUMBER 1
+ TO 14.4V PACK NUMBER 2
+ TO 14.4V PACK NUMBER 3
+ TO 14.4V PACK NUMBER 4
+ TO 14.4V PACK NUMBER 5
+ TO 14.4V PACK NUMBER 6
+ TO 14.4V PACK NUMBER 7
+ TO 14.4V PACK NUMBER 8
20 VDC
300 mA
WALL CUBE
POWER SUPPLY
+
-
- TO NEGATIVE TERMINAL OF ALL BATTERY PACKS

Fig. 1. *The wall cube power supply and current limiting resistors should be chosen so that about 28 milliamperes is delivered to each of the 14.4 volt DC battery packs. The values shown represent just one such combination; the ones you select should be measured with a milliammeter to make sure that the proper one-tenth-capacity current is present.*

Home-brewing at its best!

From Mike Hall KE4GBE: Here's a suggestion for recovering otherwise discarded NiCd battery packs. "Each month, thousands of rechargeable batteries are bought for cordless phones, often unnecessarily. Consumers will many times replace the rechargeable batteries in their cordless phones simply because it's the easiest thing to do when a problem with the phone arises, or because they've received poor advice from someone, even though there may have been nothing wrong with the batteries to begin with.

"Radio Shack® and other NiCd battery dealers now offer a recycling service to their battery customers. Since disposing of NiCd cells in landfills is not environmentally responsible, recycling depleted NiCd batteries makes good sense, but often the cells that end up in the recycling bin are still very much usable. It can pay you to make friends with the store manager at one of these retail battery outlets, so that he or she will permit you to take some of the packs home for testing and possible further use. If you promise to return any unusable cells for proper recycling, and return the currently operational cells once they've been used up, then there's really very little reason why the manager won't go along with the idea.

"Personally, I've found that roughly one-third of the battery packs that I've obtained by this method are still serviceable. Sometimes the entire pack is okay; other times, just one cell is bad. In either case, I've been able save quite a bit of money on new NiCd batteries just by following a few simple procedures.

"Most of the cordless phone packs consist of three (3) 280 milliampere cells wired in series. It's important to remember that a good NiCd cell provides about 1.2 volts. Thus, a potentially usable three-pack should read about 3.6 VDC, or perhaps a bit more when just freshly charged. When you've located several good 3.6 V packs, cut off the connector, leaving about 1/2-inch to 3/4-inch of the original pack wire still attached. Try topping off the charge on the pack using a safe, one-tenth-capacity charger (28 mA) for 12 to 14 hours.

"Now discharge the pack at a fixed current and see how long it lasts. If you can get close to the rated 280 mA capacity, you know that the pack is worth saving. Your exact end results can vary somewhat, so it's something of a judgment call. Mark the pack with your findings so that you'll know which pack delivered what amount of energy later on. A 280 mAh pack should deliver about 280 milliamperes for one hour, or 140 milliamperes for two hours, etc. Once you've salvaged several packs, then you're ready to build a larger, higher-voltage, higher-capacity, super-pack!

"If you need a pack to power a 12 volt DC QRP rig, for instance, four of the 3.6 V packs wired in series will give you 14.4 volts (about what an automobile battery delivers when the car is being driven and the alternator is replenishing the battery). To increase the current capacity (ampere-hour-capacity) of your super-pack, you can wire additional series-connected 14.4 volt 280 mAh packs and then put all of the packs thus wired in parallel. Each time you add another parallel group, you increase the overall ampere-hour capacity by about 280 milliamperes. I have one super-pack that contains 32 of the original 3.6 V packs — that is, four packs in series for 14.4 volts, then eight of these 14.4 volt packs in parallel. This 32-pack battery will deliver roughly

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prominent and in places of high exposure.

Push for the personal touch. Form letters and bulk mailings are devised for practicality. Very often, however, "personal" works better than "practical." Queries should be answered with prompt, personalized replies. Pick up the phone or show up at gatherings to personally invite people to the event. It's the little things that make a big difference.

Deliver the delights. When the day of the event arrives, deliver the fun, the learning, the friendship, the passion, and the excitement you promised. There is no worse nightmare for a publicist than for the actual event to pale in comparison to the publicity campaign preceding it.

Build bridges. Sometimes, things come up in people's lives and they can't make your event even though they wanted to. Don't force the issue. You'll want them to attend your next event. If you know the people well who miss your event, and the follow-up notices are rave reviews, you may want to send them copies of the articles.

The bottom line is that everyone likes to be part of something fun, exciting, and informative. If your own enthusiasm can be projected into your advanced publicity, you'll attract an audience that will know they're part of a "special event." Good luck!

If you or your club has come up with some successful ways to advertise your events, please write to me so that I can share them with the readers. 73

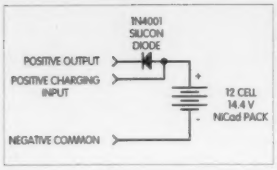

Fig. 2. *Typical 12-cell, 14.4 volt battery pack showing one positive wire for charging the pack and another positive wire for discharging the pack into the operating load through a diode.*

two and one-quarter ampere hours of energy, and it was virtually free! With it, I've been able to run my CW QRP rig for about two hours (at 1.5 A average drain).

"It's best to charge the series-connected packs individually, but that only requires eight current-limiting resistors, and eight silicon diodes, fed by one charger capable of delivering about 20 volts at 250 mA. **Fig. 1** shows the basic schematic diagram for such a simple charger using a readily available 'wall wart' power cube. It's about as basic as a reasonably constant-current charger gets and, of course, you should feel free to improve upon the design to make the current delivery even more 'truly constant' if you wish.

"So there you have it—you can help out the ecology and save money at the same time ... to me, that's home brewing at its best!"

Moderator's note: When connecting several NiCd battery packs in parallel, it's a good idea to also place a silicon diode (such as a 1N4001) in series with each pack's positive output lead (see ***Fig. 2****). This added diode prevents the tendency of unequal packs to "charge" one another during use. More important, if one of the packs should catastrophically fail (e.g., short), it will prevent the good packs from feeding the short and draining themselves at a high rate of current. A small potential will be dropped across the diode (about 0.7 V), but it's worth it for the added reassurance. Remember that a separate "charging" wire is needed, however, to bypass around the diode when recharging the pack. The pack will now have three wires coming from it ... one positive wire for charging, one positive wire (with the diode in series) for parallel operation, and the remaining common (or negative) wire.*

As mentioned, each good NiCd cell should read 1.2 VDC when it has taken a proper charge, so it's relatively easy to determine if a pack has all good cells, or just if one of its cells is defective. By the way, a fully charged NiCd cell will actually read 1.4 VDC when it just comes off the charger, but will then fairly quickly drop to 1.2 V when under load. A good cell should also hold closely to that 1.2 V figure for the bulk of its usable charge-life (before it needs recharging). If a cell reads zero, then it's usually shorted internally. If it reads less than 1.2 V, or drops significantly below that figure under load, then it has an exceptionally high internal resistance and shouldn't be used.

Please remember to properly dispose of all of your dead NiCd cells at an approved recycling center.

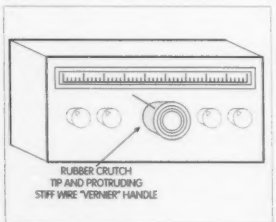

Fig. 3. *A rubber crutch tip with a short, stiff piece of wire inserted and glued to one side can be used as an inexpensive vernier tuning adapter for many older radios. See text for more details.*

The five-minute bandspread!

From Bruce Cameron WA4UZM: "One of the biggest drawbacks to many older ham rigs is their tendency to tune too fast, even if they have some sort of mechanical vernier gearing built into them. Newer ham transceivers, with digital electronic tuning, offer a verrrrry slow tuning option, but here's something that you can try on your older rig without spending a fortune or investing hours of modification time.

"Just remove the present tuning knob from your radio and make a trip to your local medical supply store. There you'll likely find replacement rubber tips for use on crutches, canes, walkers, and other mobility aids. These replacement tips will often fit nicely over the current tuning knob on older equipment (just bring the knob along), giving you the basis for implementing the rest of this idea.

"Once you've located the right crutch or walker rubber replacement tip, insert a stiff piece of piano wire, sharpened to a point on a grinder or with a file, into the rubber tip as shown in **Fig. 3**. By the way, stiff piano wire can usually be obtained at any well-equipped hobby shop in town, or you can simply use a small section of a wire coat hanger. You may also want to put a tiny dab of glue or epoxy around the wire to keep it firmly in place. The wire needs to protude out of the crutch tip only two or three inches—short enough so that it clears the desk below when the knob is rotated. That's all there is to it! The new tuning knob cover with its protruding wire gives you the extra 'lever-arm' needed to make your old fast tuning action considerably more 'vernier' in feel and in action. Give it a try and you'll see what I mean."

Murphy's Corollary: In crisis situations that force us to choose among alternative courses of action, most will lead us on an entirely wrong course!

As we begin the fourth consecutive year of the "Ham To Ham" column in *73 Magazine*, we offer a very special thanks to this month's contributors, including:

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If you're missing any past columns, you can probably find them at *73*'s "Ham To Ham" column home page (with special thanks to Mark Bohnhoff WB9UOM), on the World Wide Web, at: [http://www.rrsta.com/hth].

Note: The ideas and suggestions contributed to this column by its readers have not necessarily been tested by the column's moderator nor by the staff of *73 Magazine*, and thus no guarantee of operational success is implied. Always use your own best judgment before modifying any electronic item from the original equipment manufacturer's specifications. No responsibility is implied by the moderator or *73 Magazine* for any equipment damage or malfunction resulting from information supplied in this column.

Please send any ideas that you would like to see included in this column to the moderator at the address at top. We will make every attempt to respond to all legitimate ideas in a timely manner, but please send any specific questions, on any particular tip, to the originator of the idea, not to this column's moderator nor to *73 Magazine*. 73

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Radio Direction Finding

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Practice, education and fun

Field Day is an important emergency preparedness exercise. That's what we always tell the local media, right? We don't admit, even to ourselves, that the main reasons we do it are to pig out and to play radio. Nevertheless, a lot of learning always takes place at Field Day. We figure out how to use unfamiliar rigs. We patch together a laptop computer, TNC and handie-talkie to make a working packet station. We dangle from poorly-supported towers to fix non-performing antennas. Some of us even renew our CW skills. In short, Field Day makes education fun.

Similarly, hidden transmitter hunting (sometimes called T-hunting or foxhunting) is an enjoyable and exciting way to learn and practice the skills of radio direction finding (RDF). Chances are good that these skills will come in handy for you at some point. There's always a need for hams who can quickly and efficiently track down the sources of stuck carriers, malicious QRMers, cable TV RF leakage, power line noise, and so forth. Some hams go a step further and volunteer to track down Emergency Locator Transmitters (ELTs, see **Photo A**) and other kinds of rescue beacons as members of the Civil Air Patrol, US Coast Guard Auxiliary or local search and rescue organizations.

You never know when signal-tracking skills will be needed. When they are, it's too late to practice. The more experienced you are, the speedier you'll be when it counts. The above-mentioned rescue agencies usually have training programs in RDF techniques, but you don't have to take a formal class to become proficient if there are enough "just for fun" ham radio T-hunts in your area. If there aren't, maybe it's time to get the ball rolling. One way for you to increase the number of T-hunters and RDF experts in your area is to teach it.

Ernie Howard W8EH recently wrote to tell about a four-week foxhunt class in Ohio. "It was at the same time and location as our normal Novice/Tech license classes," he wrote. "On the fourth week, we had an on-foot six-fox hunt at the local Miami University branch campus. Everyone got to practice using antennas they had just built. There were lots of woods and parking lots to hide things in, plus plenty of reflections to follow. We now have a dozen or more people interested in foxhunting and everyone wants to know when the next one will be."

Practice pays

John Oppen KJ6HZ enjoys mobile T-hunting in the Los Angeles suburbs. Although he realizes the usefulness of sophisticated RDF equipment, he also likes to see how well he can do with nothing more than a handie-talkie or scanner, by paying close attention to the terrain and RF environment. In May of this year, he came to an international-style on-foot foxhunt that I put on in Placentia, California. All the other competitors used their special amplitude-based sniffers, Time-Difference-Of-Arrival add-ons, and so forth.

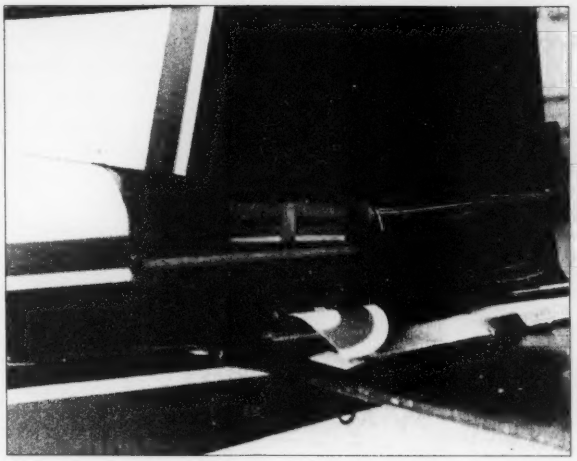

***Photo A.** There is an Emergency Locator Transmitter (ELT) inside the tail of almost every aircraft. When one starts transmitting for any reason, quick action is needed. (Photo by Tom Curlee WB6UZZ.)*

John used only his handie-talkie and the "body shield" technique. He punched in at all five transmitters in the 65-acre hunt area and got to the finish line 11 minutes ahead of the second place finisher.

John's RDF experience and

Continued on page 50

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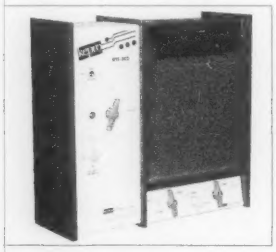

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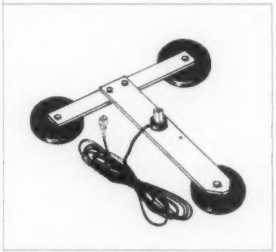

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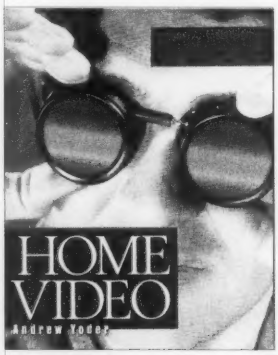

FOR HOME THEATER BUFFS

Andrew Yoder, whose name you may recognize from his previously published books, has written a new one: *Home Video*, subtitled *Choosing, Maintaining, and Repairing Your Home Theater System*. And it's a doozy. These 339 easy-to-understand pages contain everything you'll need to know about home video, including how to cannibalize old electronics equipment to build your own home theater from scratch! If you're into cocooning, expecting a very long winter (nuclear or otherwise), or ready to remodel your home to include a fully-equipped entertainment suite, pick up a copy ($39.95 hardcover, $24.95 paperback) of Yoder's *Home Video* wherever TAB (McGraw-Hill) books are sold.

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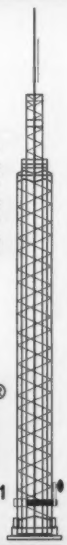

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Homing In

continued from page 47

attention to detail helped him perform a useful public service at Long Beach Airport last June. "I had never planned to do anything but recreational hunts and perhaps catch a jammer or two," he wrote, "but I guess you're right when you talk about using RDF for other useful purposes.

"The parking lot at my work site is directly adjacent to the airport," John continued. "I had just left work and was casually tuning in to the control tower on my Kenwood TH-79. I heard a strange noise as I spun the dial around. It was coming from the ELT frequency that I had programmed in a long time ago. The signal was full-scale on the S-meter.

"I removed the HT antenna and couldn't hear the signal that way. I drove out of the lot and down a road where several small aircraft were parked and still heard nothing. I put the antenna back on and noticed that it was much weaker. At that point, I was shielded by a large metal building to the south. As I turned around and came out from behind the building, the signal came up. That told me it was at the same side of the airport as I was, and to the south of me.

"With the antenna off again, I drove down another road that connects several aviation businesses. It was briefly audible without the antenna as I passed a fence with a couple of aircraft parked alongside, but disappeared as I continued. I drove back and parked near the fence where it was loudest. As I started to walk toward the fence, someone came out of the business to see who was parking. I told her that I had heard an ELT and thought it might be from one of the aircraft nearby. She let me into the hangar, but none of the planes inside were the source. As I continued out the back, the signal picked up in strength. As we approached the first of the aircraft parked outside along the fence, the signal went to full scale. As the owner went inside for the keys, I tuned several kHz off and held my HT up to the ELT antenna. There was a full-scale reading with no antenna on my HT.

"After unlocking the aircraft, the owner fiddled with a yellow box inside. The signal disappeared. It turned out that the ELT was normally connected to some interior panels, which presumably held the sensors. The panels had been removed for some reason and the sensors unplugged, setting off the ELT. Somewhat chagrined, the owners of the business thanked me and I went on my way. The whole thing was over less than 15 minutes."

It's typical for agencies like CAP to provide special RDF sets to their members for ELT tracking. When an ELT comes on the air, each member has to find his or her RDF set (*Where is that thing, anyway?*), set it up (*Darned batteries are dead again!*), and drive to a place where he or she can hear the signal. That takes valuable time. So it's great when someone like John can instantly act upon detecting an ELT signal with nothing more than a handheld. Good work!

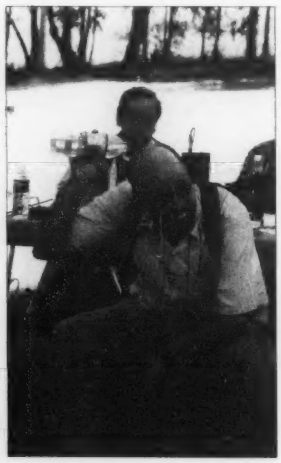

***Photo B.** J. Scott Bovitz N6MI took the shortest time to find four foxes, but he needed to cool off afterward. Jay Hennigan WB6RDV looks on. (Photo by Joe Moell KØOV.)*

Showdown in Hungary

As I write this, Team USA is en route to Nyiregyhaza, Hungary, for the Amateur Radio Direction Finding (ARDF) World Championships. This year's event takes place in early September at the *Bessenyei Gyorgy* Teachers' Institute, 150 miles northeast of Budapest. It is bringing together the best on-foot foxhunters (also called foxtailers and radio-orienteers) from more than 20 countries. During the week-long festivities, there will be two strenuous ARDF contests on successive days, one on 80 meters and the other on two meters.

Three members of Team USA got a dress rehearsal for the championships at a realistic two-meter ARDF practice session that I hosted in Hacienda Heights, California, on the first weekend of August. It was open to everyone who wanted to try the sport, experienced or not. Several RDF sets, both self-contained receiver-antenna units and add-ons for ordinary handie-talkies, were available for loan. Team Captain Dale Hunt WB6BYU of Yamhill, Oregon, participated, as did Team Member Marvin Johnston KE6HTS and Team Trainer Dennis Schwendtner WB6OBB. Other members of the US delegation to the championships were unable to attend.

Despite temperatures in the 90s, everyone had a great time. Eighteen persons took to the course, attempting to find six transmitters (called foxes or Ts) on 146.565 MHz. Each one came on the air for 60 seconds at a time, one after another, in numbered order. Most foxhunters went out alone, but there were also a few pairs and trios. Teaming is not permitted in formal championships, but was allowed here because it is an excellent way to teach RDF techniques. WB6OBB was assisted by Extender Jay Hennigan WB6RDV. Dennis would not be allowed to officially compete in Hungary, because International Amateur Radio Union (IARU) rules presently forbid assistance for blind persons on the course.

International championship hunts have five foxes and a time limit of 100 to 140 minutes, depending on the course length, as determined beforehand by the judges. Anyone who does not return to the start/finish line within this time limit is disqualified, no matter how many foxes he or she has found. For this session, however, there were six foxes and no time limit. Hunters could stay out longer, for extra practice. They had the option to seek all six foxes if they wished.

Transmitters were placed in accordance with standard guidelines for IARU foxhunts. None were buried or concealed inside a covered object. Registering punches were readily visible to sharp-eyed observers, either at ground level or eye level. All foxes were within the boundaries of the nine-by-12-inch topographical orienteering map carried by each hunter or team. The map included most of Schabarum Regional Park and part of the Powder Canyon Wilderness Area.

In accordance with IARU rules, all foxes ran the same power level (0.75 watts) into identical antennas (quarter-wavelength vertical whips). Regulators in the foxes kept their RF output power constant through the hunt, compensating for battery voltage sag. The only departures from Euro/Asian-based IARU rules were the use of FM instead of AM tones and vertical instead of horizontal polarization. This made it easier for hams who used RDF sets with switched dual vertical whips.

The easiest fox (T1) was at the bottom of a chain-link fence near the park stables, 540 meters east of the starting point. The hardest (T5) was in the base of a tree in the thicket adjacent to a fire road 1.9 km southeast of the start. Elevation of the foxes ranged from 480 to 990 feet above sea level. The start point

On the Go

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4
1011 Peacock Ave. NE
Palm Bay FL 32907-1371
[ke8yn@juno.com]

As I'm preparing this column, the smoke from the wildfires here in Florida has only recently stopped being the prevailing aroma. Naturally, amateur radio played a significant support role in the firefighting and relief efforts both in the areas threatened by the fires and in the surrounding counties. In the meantime, hurricane season is in full swing, with three named tropical storms or hurricanes currently on the map—one building, one approaching the coast, and one dissipating over Texas. As a Skywarn coordinator, I'm talking to the weather service on a regular basis. They expect the storm to turn north and miss our area. However, Disaster Services has to prepare for the worst and has decided to begin preparing some of the special needs shelters—just in case—so I'm talking with them regarding possible duties, as area hams have been put on alert to provide shelter communications. As amateur radio operators we have a duty to our community, and sometimes we have to pay up, big time.

With all this going on, I obviously have been pretty busy and haven't had a lot of time to prepare an in-depth construction article or a scholarly review of mobile trends. I have had the time to see a lot of our concepts in action, and have thought of things which are now on my to-do list, and maybe should be on yours, too.

During the Florida wildfires, trained firefighters from all over the country came to assist. Even though these were accomplished professionals, there was the need to provide information (at the least) or training on some of the peculiarities of firefighting here. For example, did you know that a tree falling over during a forest fire makes no sound? Some people wondered why there wasn't greater reliance on the National Guard, but those who were used needed to be given a crash course in forest-firefighting by the US Forest Service. If trained firefighters and the National Guard, both of whom train regularly, recognize the need for mission-specific training, why do many amateurs feel that by breathing and having a radio they'll be ready to face any contingency? To quote one of my instructors when I was just a young pup, "You're good, but you're not *that* good!"

At the same time, of course, we had lost two American embassies to terrorist attacks and had taken military action in Sudan and Afghanistan. As expected, reprisals against Americans have been threatened, possibly even here in the United States. What could this mean to us?

You've probably grown tired of me recommending that you work closely with the agencies you expect to serve long before an emergency occurs. However, most hams have no experience,

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was at 620 feet. You can see all fox locations and an aerial photo on a special page at the "Homing In" Web site.

Was it too hard?

Nobody found all six foxes, but that's not as bad as it seems. The goal was to have two easy ones, two intermediate, and two that were really difficult. T2 and T5 (the hard ones) were accessible from trails, but they were near hilltops deep in the Powder Canyon Wilderness. The horse trails are long and the foot trails are steep in that region. Getting to all six foxes and back in two hours would have required the speed and stamina of an experienced long-distance runner. Unfortunately, no marathoners showed up.

Under IARU rules, competitors in all divisions except Senior (males age 18 to 40) are required to seek only four foxes. Seniors must seek five. It's an important part of strategy at the championships for competitors to carefully select which one(s) to omit. Most hunters wisely chose not to go after T2 and T5. A no-mistakes circuit from start to each of the four lowlands foxes (T1-T4-T6-T3) to the finish was about four kilometers, making maximum use of the horse and foot trails.

Overall winner was J. Scott Bovitz N6MI (**Photo B**), who found the four lowland foxes and returned in two hours, 15 minutes and 25 seconds. Scott is an experienced radio-orienteer, having competed against foxhunters from the US, Canada, Japan and Asiatic Russia in the Friendship Radiosport Games (FRG) foxhunts in Portland, Oregon (1991), and in Victoria, British Columbia (1993).

Less than three minutes behind Scott to return after finding four foxes was Dale Hunt WB6BYU, captain of ARDF Team USA, who flew from his home near Portland, Oregon, for this event. Dale competed at the Friendship Games foxhunt near Tokyo, Japan, last year, where he finished first among all entrants from North America.

Also finding all four lowlands foxes were Marvin Johnston KE6HTS and Scot Barth KA6UDZ, in that order. Both are experienced, having participated in formal ARDF contests at Hamcon-95 in San Pedro, California, and the 1996 West Coast VHF/UHF Conference in Cerritos, California. Scot was overall winner at the 1995 event and Marvin was leader in his age division.

Marvin has organized on-foot foxhunt sessions for the Santa Barbara Amateur Radio Club. Five other individuals/teams found at least one fox.

The field of contestants included two members of the Los Angeles Orienteering Club, each experiencing foxtailing for the first time. ARDF is similar to classic orienteering because it takes place in the woods with orienteering cards, punches, and maps (see "Homing In" for June 1998). In both sports, it's best if the participant carefully plans a course to cover the maximum number of controls (or foxes) in minimum time. If you are looking for potential radio-orienteering stars in your area, the nearest orienteering club would be a good place to start.

By the time you read this, the 1998 ARDF World Championships will have concluded. Check the "Homing In" Web site to find out how Team USA performed. Think you could do better?

Start training now and plan for practice events in your own area. Perhaps we'll see you at the next multi-nation foxtailing championships. Next year, there will be one here in the US.

The Friendship Amateur Radio Society (FARS) of Portland, Oregon will host radio-athletes from the US, Canada, Japan and Asiatic Russia for the sixth biennial Friendship Radiosport Games during the second week of August 1999.

FARS is seeking approval to expand this get-together into the first IARU Region 2 (North and South America) ARDF Championships. Watch for more FRG-99 news and announcements here. 73

QRP

Low Power Operation

Michael Bryce WB8VGE
SunLight Energy Systems
955 Manchester Ave. SW
North Lawrence OH 44666
[prosolar@sssnet.com]

No matter how complex a piece of electronic equipment may be, it's still a collection of smaller circuits. By wiring everything together, you end up with perhaps a guidance system for a missile or a 38 Special. In our 38 Special, some of the circuits perform double duty. The product detector, for example, is used as the transmit mixer, too. A design like this allows you to reduce the overall number of components in a project—but it also makes troubleshooting a bit tougher!

A case in point is the now somewhat goofy receiver mixer in my 38 Special. As I told you last month, the output of the receiver mixer was way below the level needed for proper injection into the IF section. Although the mixer was in fact oscillating, there is not enough output to do any good. It's one of those cases in which the circuit works, but does not work correctly.

The revenge of the oscillator from hell!

If you have been following this column for the last several years, you may recall the "oscillator from hell" column. In a nutshell, I had a circuit that was supposed to oscillate like mad, but did not. To make matters even worse, everything was wired correctly and the circuit contained brand-new parts. Now, this receiver mixer comes along and guess what? It won't work like it should.

After a few hours of looking for bad solder joints and misplaced components, I decided to have another look at the output of the oscillator with my scope.

As before, I could see the NE602 was, in fact, oscillating. Pushing in the "magnify" button on the scope's time base showed a lot of critters growing on the sine wave. I then coupled the output of the NE602 to my counter. Much to my surprise, the counter did in fact show the mixer running at 22.118 MHz. The only trouble was that the display was less than rock solid. It moved around a bit. This indicated to me that there were in fact critters riding on the output. But where were they coming from?

To better understand what was going on, I decided to build the receiver mixer on my protoboard. I deleted VXO components such as the 4.7 µH choke and the 1N4004 diode.

If you've never worked with the NE602 oscillator/mixer chip, a word of warning: They will fry if you put more than eight volts on pin 8 of the chip. Make sure you have a 0.1 cap on the Vcc pin (pin 8) to decouple any RF to ground. Keep your leads short and direct. Unwanted inductance will mess things up when trying to use the NE602 on a protoboard.

I ordered a new crystal from Mouser Electronics for use in my protoboard latchup. For good measure, I ordered several rocks at 22.118 MHz. They're a standard computer crystal and are only a few bucks a pop.

With my latchup running on the protoboard, my scope showed a rock solid (sorry!) output from the NE602 and the 21.118 MHz rock. However, the output level was not close to the 1.2 Vpp output at pin 7 of the NE602. The output did have much more bang than the circuit running on the 38 Special board, however.

I decided to take a closer look at the circuits the receiver mixer was feeding. To isolate the CD4066 analog switch, I removed C11. This uncouples the output of the receiver mixer from the 4066. Once again, the scope showed a rather wimpy output level.

Getting desperate, I removed the CD4066, thinking that the chip might be loading the output down via the IF filter. I installed a new CD4066 and the results were the same. I could

Continued on page 53

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little or no training, and very little notion of what demands a terrorist attack might place on us. Naturally, there would be the usual support for shelters. However, any work with the enforcement agencies or the military could be quite different. In some areas, those who work with the police department undergo a background check and are issued an identification card. During a terrorist situation, police and other agencies would be very hesitant to allow access to anyone who had not been thoroughly checked out. Don't be surprised, in the wake of a terrorist act, if a police official is unwilling to accept (or officially forbidden from accepting) an ARES or RACES card as proof of identity or need for access to a particular area. As usual, the time to plan is well in advance of the situation, not once the situation presents itself.

Potpourri (French for "small items which cannot be a complete column no matter what I do")

•Why isn't there more interest in portable packet? As computers continue to develop, more 286, 386, and 486 laptop computers are showing up at bargain prices. Often when we talk about portable or mobile operations we tend to think of FM, SSB or CW, yet modes such as packet lend themselves very well to portable operation. A laptop computer, even an early one like the Tandy 100, or even some palmtops can be connected to a handie-talkie to provide packet in a hotel room or even a camping tent. Although a TNC is normally required, there are some software packages that use sound boards to handle the translation of audio to digital and vice versa. I know some folks are running APRS this way, but haven't heard much about regular packet. Let me know if you are.

•While operating HF mobile, I usually note contacts in local time and convert the times later. Since small digital clocks are so inexpensive, I'm going to find one that has 24-hour format, set it for UTC and hook it to my dashboard with Velcro®.

•I've seen ballpoint pens with built-in flashlight sold in office supply stores. What a great idea for use in the car after sundown. No fiddling with dome lights or map lights and no interference with night vision!

•External speakers can make a handie-talkie much easier to hear in a car, but sometimes there's no convenient location for a speaker. Once again, a little Velcro can go a long way for mounting a small lightweight speaker.

•When working disaster relief off the beaten path, a compass can be a major advantage. I'm going to add to my "grab bag" one that is large enough to read easily.

These ideas can be reworded and written in your own handwriting for a Christmas list. It should give the spouse or kids some ideas in lieu of the socks and neckties. And remember, if all else fails, every ham can always use one more battery pack for the HT! 73

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see this was not going to be an easy project!

Once again, while I had the desoldering iron hot, I installed an 8-pin socket for the NE602 chip used for the receiver mixer. Although a socket is not desired in this location, the added lead length may cause unwanted inductance to rear its pesky head. I figured a few more chip swaps would surely destroy the PC board's foil pattern.

A good dose of denatured alcohol was used to clean up the PC board. All that desoldering and solder flux made a mess of things on the board. With the now cleaned PC board, I gave it the once-over one more time, just to be sure that there were no stray whiskers of solder shorting out some pads.

I checked the output of the product detector, too. It's a carbon copy of the receiver mixer, more or less, and it's working just fine. I don't have 1.2 Vpp, but there's more than ample drive coming from the NE602 to drive Q1.

A short detour

Since I had the desoldering equipment running, I replaced the PA stage, the 74HC240, with a new chip. The reason for its replacement was simple. It got so hot it caused a finger burn. By the way, you must replace the 74HC240 with a 74HC240. The 74HT240 won't do the job. Mouser has these chips in stock and they are less than $2 each.

And since I was in the neighborhood, I also installed a new power FET. I surmised that if the 74HC240 was cooked, it was a good bet the FET was toast as well. Remember, this rig had the high power modification put in. The 74HC240 drives the power FET to 3+ W on 10.100 MHz.

Still no go from the receiver mixer

After I have replaced all the parts with the associated circuits, I still do not have a working 38 Special. Once again, I am stumped as to why the oscillator does not work like it should.

As I was working on this rig, I did notice something odd. If you placed a finger near the wires leading to the main tuning control, the output of the receiver mixer changed. It changed both in amplitude and in frequency. That's something that's not supposed to happen.

With the scope once again monitoring the output of the oscillator, I could grow critters on the sine wave by moving my hand near the main tuning control. This explains the junk on the signal, but I still don't know why touching a wire should cause the oscillator to go to pot.

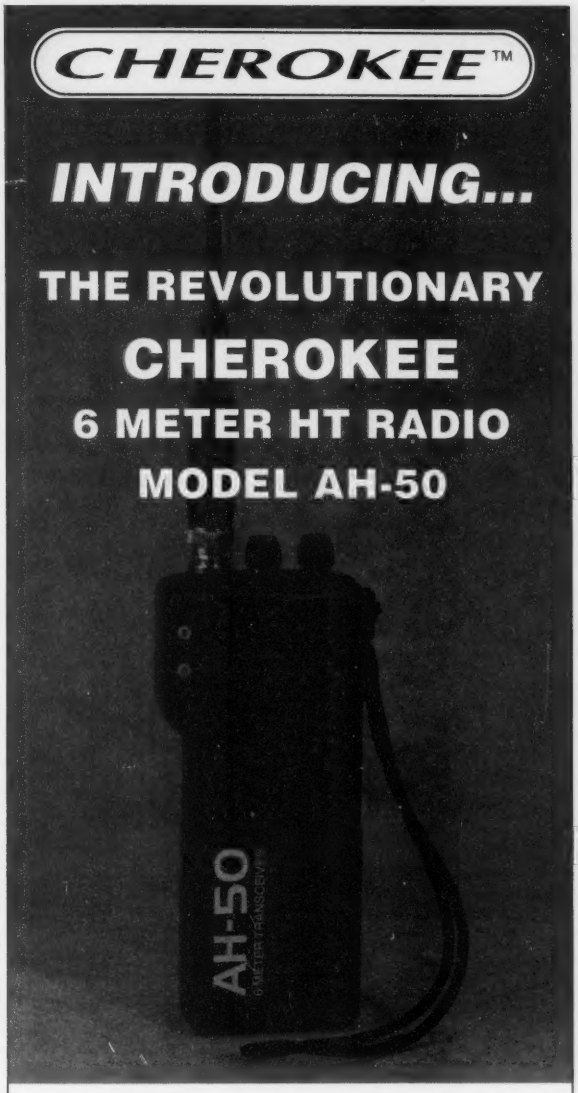
The control voltage generated by the main tuning pot is used to forward bias the 1N4004 diode. This causes the diode to change its capacitance. And, by the way, you must use a 1N4004 diode here. A 1N4001 or similar will not work. For some reason, there's RF getting back into the VXO circuit. So, right now, I'm in the process of ordering a new 4.7 µH choke and VXO diode. That's about the only thing I have not replaced in the entire receiver mixer circuit!

I even went so far as to scope the power supply bus. If you have a 7808 regulator that's making a lot of noise, perhaps that's the reason for some of the junk appearing on the receiver mixer's output. Alas, the regulator's output is nice and clean. No trouble here.

Time for a rest

After working on the 38 Special off and on for a month, it's time to give it a rest. Seems the more I look, the less I see. Right now, this one's got me beat. It's so simple that perhaps I'm just overlooking something. I guess this may be a case of, "Sometimes you're the windshield, sometimes you're the bug!" On the other hand, I've not yet thrown the rig up against the

Continued on page 55



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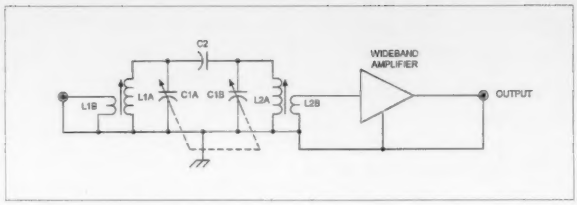

Fig. 2. Preselector schematic.

Receiver accessories: Do you need them?

There are a number of different accessories that can be added to a communications receiver to "make it better." Or do they? Some of them are built-in options that you can obtain from the original equipment manufacturer. Others are aftermarket or home-brew add-ons that come from a number of different manufacturers.

So do you need them? The answer is an unqualified "It depends!" Sorry for the waffling, ambiguous answer, but it's really a case of the situation, what you are trying to accomplish, and a host of other things.

IF filters

The IF filters for your receiver set the bandpass of the IF amplifier, and therefore set the selectivity characteristics of the receiver. The bandwidth and shape factor of the filter are of interest in improving selectivity. The bandwidth should be matched to the modulation mode being received. For example, CW might use 250 to 500 Hz filters; RTTY: 1.8 kHz; SSB: 2.3 to 3 kHz; and AM: 4, 6, 8, or 10 kHz.

I own a Drake R-8A receiver, which came equipped with 500 Hz, 1.8 kHz, 2.3 kHz, 4 kHz and 6 kHz filters on board. I can match the filter to the mode and conditions. For example, I would normally use a 2.3 kHz filter for SSB, but under some circumstances, where the band was particularly ragged, I might switch to 1.8 kHz and accept the reduced clarity for less QRM.

In general, the rule is really simple: The narrower the bandwidth, the less the noise. On AM reception, which I used for the international broadcast bands, I prefer listening with the 6 kHz filter because it has better fidelity. But the normal case is that those bands are quite crowded, so the 4 kHz filter is more reasonable. I tend to use the 6 kHz filter on the AM BCB, however.

Extra IF bandpass filters are almost always a reasonable thing to buy for your receiver (even though quite costly).

Audio filters

Audio filters are sometimes used to provide narrow bandwidth for eliminating unwanted signals. The first one I saw was a World War II surplus outboard device that was used on B-17 bomber "Command Set" receivers. It was an L-C filter that passed a narrow band of frequencies around 1,050 Hz, and was used for copying CW signals in the presence of lots of other signals. Modern versions are designed around either L-C filters (often with selectable bandwidths) or operational amplifiers ("active filters"). Even if you have some pretty good filters in the receiver, an external audio filter is often a help in working crowded bands.

Antenna noise eliminator

One of the nasty things about listening to shortwave, especially in the 160-meter, 75/80-meter, and 40-meter (plus mediumwave broadcast and "tropical") bands, is the rather raucous noise level from power line harmonics. Normally, you would not expect much problem from the harmonics of a 60-Hz source when listening to shortwave bands. After all, there's a lot of distance between, say, 5,000 kHz and 60 Hz. But there are a couple of problems with that argument (not the least of which is experience ... go listen to it!).

First, the high powers (kilowatts) mean that harmonics are proportionally stronger. Second, high voltage corona and arcing can cause RF noise. Third, even at 120/240 volts, loose connections, appliances, dimmers and a host of other things will cause RF noise. It goes on *ad nauseam*.

One solution is to use an external RF noise blanker (**Fig. 1**). Several such circuits have been published in ham magazines over the years. Most of them work by sampling the local RF environment on a whip antenna using either phase shifting or inverting the sample, before combining it with the signal from the main antenna. The inverted and noninverted versions of the noise signal are combined and cancel each other out, leaving the signal from the main antenna. MFJ Enterprises, Inc. [P.O. Box 474, Mississippi State MS 39762; (601) 323-5869 (voice); (601) 323-6551 (FAX); (800) 647-1800 (orders only); Web site: (http://www.mfjenterprises.com)] has a product based on this idea. Their Model MFJ-1026 eliminates locally generated noise before it reaches the receiver. It looks like an active antenna (which it can also be used as), but plugs in the line between the "real" antenna and the receiver's antenna jack. It cancels noise in the signal that matches the noise picked up by its little whip antenna.

Antenna tuning units

Antenna tuning units are generally not needed on receivers if the purpose is to match impedances. Reception is a lot more tolerant of mismatch losses than transmission (which can be damaged by VSWR), so there is usually little need to match the impedances. The insertion loss of the ATU is about the same magnitude as the mismatch loss without the ATU, so why bother?

Why bother? That's a good question. There is a use for receiver ATUs that is quite handy: prefiltering. If your receiver has to contend with too many too-large signals, or if it has a marginal third-order intercept or dynamic range specification, then performance can be enhanced if

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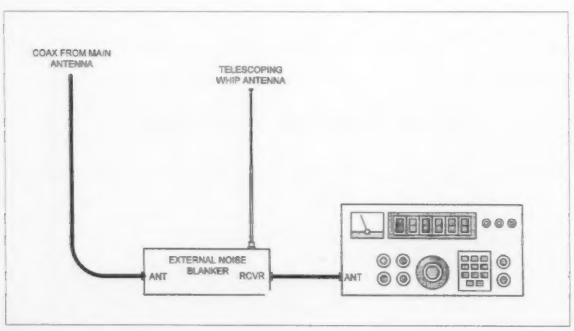

Fig. 1. Using an RF noise blanker.

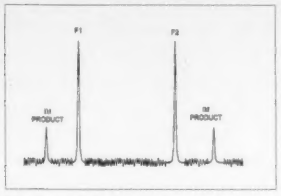

Fig. 3. Mixed signals in a nonlinear circuit produce IM products.

an ATU discriminates against a strong, unwanted signal.

Preselectors

A preselector might be either active or passive. **Fig. 2** shows a circuit that can be used as either. The preselection is provided by the tuned circuit, while a wideband amplifier (such as a low-noise MIMIC MAN-6 or other product) provides gain where needed. The preselector circuit consists of two L-C resonant tank circuits coupled through a common reactance (in this case, the capacitive reactance of C2). Design of these circuits is discussed in the *ARRL Handbook*.

The main reason for using the preselector is shown in **Figs. 3** and **4.** Receivers don't respond in a linear manner to high level signals (of which bands are full). Indeed, the strong signal doesn't even have to be in a ham band to cause problems. Assume in **Fig. 3** that signal F1 is the signal you want to copy, while signal F2 is a strong interfering signal on an off-channel frequency. When the two mix in a nonlinear circuit (such as a receiver front end that's overdriven), a number of spurious intermodulation (IM) products are created. These will be at frequencies described by mF1

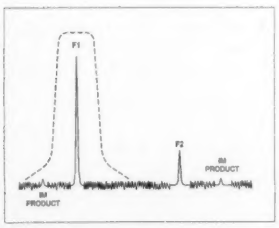

Fig. 4. A preselector can reduce the IM products.

± nF2, where m and n are either integers or zero.

The mixing products that are the worst case are the third-order difference signals. The third-order products are 2F1 + F2, 2F1 - F2, 2F2 + F1, and 2F2 - F1.

Of these, the difference versions are the nastiest. Let's consider two cases. Suppose you want to copy a signal on 14.220 MHz, and there is a strong loudenboomer carrier at 14.240 kHz. The third-order IM products are 2F1 + F2 = 42.68 MHz; 2F1 - F2 = 14.20 MHz; 2F2 + F1 = 42.70 MHz, and 2F2 - F1 = 14.26 MHz.

Of these, the difference products are the most bothersome because they fall in the same band as the desired signals. These are shown as "IM products" in **Figs. 3** and **4**.

But look what happens if the receiver is equipped with a preselector (**Fig. 4**). It will attenuate the undesired F2 signal, and that may drop the overall signal level hitting the receiver below the point that drives it into nonlinearity. As a result, the IM products are reduced as well ... possibly into the noise level.

So do you need the amplifier? Or what about any preamplifier? The answer is simple: It depends. Sighhh ... I know that's not very satisfying, but it's true. The general rule is to look at two factors.

First, does the noise situation improve? If the preamplifier is a very low noise amplifier, then it could conceivably improve the noise performance of the receiver. But if it adds too much noise, then forget it. It will actually hurt you.

Second, does the extra gain put signal levels at the point where they overdrive the receiver? I saw a report from G-land where an amateur had two 20-dB gain two-meter preamplifiers ahead of his receiver. He reported to another amplifier that the poor guy's signal was appearing on two or three spots on the dial. The "problem" disappeared when the rebuking amateur disconnected those darn preamplifiers. So, it depends ... on whether you need the gain and can tolerate it! 73

QRP

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north wall in the basement. And that's an accomplishment!

I think I'll check my safe deposit box. Maybe someone put the Hope diamond in it.

Next month, I'll show you some simple audio amplifiers you can build. It seems that the audio section of most QRP transceivers is usually lacking in performance.

I welcome your input and questions regarding low-power ham radio. Send me your comments, good or bad, at the address at the top of the page—or if you want a faster response, use the E-mail address, also shown at the top of the page. 73

LETTERS

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The construction was spread over half a week. I took Ramsey's advice and did not install a jumper that would have boosted the power output. The initial checkout was approached with the same anxious anticipation of old. Would it work, smoke, or melt? Fortunately, it worked perfectly right off (a personal best for me for a project of this size). After installing the board in the case supplied by Ramsey, I connected the unused tape output leads from my primary hi-fi system to the transmitter, found a quiet spot in the FM band and put it on the air. The only problem was that some RF was getting into my primary amplifier. That was solved by putting a little space between the transmitter and the amplifier and adding some RF shielding to the audio leads. Downstairs in my shop, at the furthest point from the transmitter, I tuned in to my new station and had perfect reception. It also worked equally well in my den. Now, I have music playing all through the house, and on Saturday mornings during the Metropolitan Opera season I can listen to the opera without missing a note when I move about the house. What a blast! The FCC is unlikely to bother me. Testing range resulted in a good signal for a radius of 25 feet outside the house and no useful signal at 100 feet. I also chose an even-numbered frequency to lessen interference.

Now for the Ramsey TV camera and transmitter!

If you're getting the Damark© mail-order catalogs you've seen the 200-CD players selling for around $250 with a remote control (call 800-827-6767 #B-64781-640699). Great source for such a mini-broadcast system. That'll play music for a week, night and day ... Wayne.

Roger Sellers N5EEA. Whew! It's all over now. If you were there, you know it was a fun and interesting meeting full of unique topics and discussions. For me, it was one of the most interesting RARA meetings I have attended. On September 17, I had the pleasure to coordinate Rockford Amateur Radio Association's hosting Wayne Green of *73 Magazine* for the club's September meeting. It was an interesting day of discussions. Chuck Gooden N9QBT and I met Wayne Green and his wife Sherry at O'Hare Airport in Chicago and drove them to Rockford. The two-hour ride back was great and Wayne gladly answered our questions and filled the time with some very interesting anecdotes. I don't think there are too many of us who wouldn't like that opportunity. He has a very humorous slant on life, the computer industry, and aspects of amateur radio. His insights and opinions, based on his years of opportunities and experiences,

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were terrific to hear. There are not too many people I have met who have experienced as many things. His comments were certainly thought-provoking. His answers to some of the questions were insightful, and at times controversial. But I think he enjoys those most. He encourages people to expand their capabilities, to take risks, to think for themselves, and even question what is commonplace. He seemed to me not to perceive himself as anything special or out of the ordinary as a person, just someone who takes the initiative and acts rather than sitting back and hoping someone else will do it.

Wayne spoke for about 45 minutes on some of his experiences in amateur radio, computers, and business. He then took questions for about 45 minutes. The questions ranged from his opinion on ARRL actions and the future of amateur radio to obscure health studies, or esoterica, such as the size and shape of the universe. He constantly encourages readers of his magazine to read about other things besides amateur radio, and our club meeting was no different. Based on some of his answers, he clearly has done what he encourages others to do.

We had a number of guests from around the area who attended the meeting. Paul Larson KB9MCX of the Belvidere Big Thunder Club stated that he'd thoroughly enjoyed the evening. He felt Wayne's comments were at times questionable, but nonetheless, since Wayne was obviously well-read, had maybe a bit better perspective than the rest of us. In any event, he had a good time there. Marc Pichette VA3DRV was passing through the area and came to the meeting. He said he can't wait to get home and tell his club there about being able to attend this RARA meeting.

Sam Williams WB5YNI, who is an instructor at Rock Valley College and is teaching a data communications class, brought the students from one of his classes. The students enjoyed the opportunity to listen to and ask questions. Wayne talked on a number of topics they related to and were interested in knowing more about. A number of Rockford area amateurs were able to attend as well; many were not members of the RARA, but they were still glad we were able to have this event in Rockford.

As the coordinator for this event, I would like to thank RARA for its support and the board members for taking the risk in approving this once-in-a-long-time opportunity. Since the club did not charge for the event and made no money on it, they placed a lot of faith in trying to make my crazy idea happen. It was not done for the club or any single person. There was no tangible or opportunistic effort by the club to recruit members, so the club had nothing directly to gain by sponsoring this. It was done for good will and to promote amateur radio. There is no way I could have had the evening occur and run so smoothly without the assistance of others. RARA was able to sponsor this event and present it free to the attendees. I would particularly like to acknowledge the assistance of several members in making this event possible. Thanks to Sheri Harlan KB9SH, Gene Harlan WB9MMM, Chuck Gooden N9QBT, David Whiteside KB9RGW, John Lawrence N9OTC, Tom Shouler N9VJU, Herb Eckstein K9AMJ, and any others that assisted in making this event successful.

I would also like to thank all amateurs that were able to pass along the information about this event to help it happen. And a special thanks to all who attended: I hope you enjoyed the evening and were glad you were able to make the time to attend.

Lastly, I would like to thank Wayne: You volunteered to make the extra effort to visit with us in Rockford. You had to make changes in your itinerary in order to attend our meeting. In a world where everyone is always too busy to do things for others, and so many people are not as they seem, you teach a great lesson.

You have stated in the past that you support people and clubs that take risks and do things to promote amateur radio. It's refreshing to know that as a publisher, and amateur radio operator, you practice what you preach/write. From a simple idea, we stretched and asked for your assistance; you kindly accepted the invitation without hesitation. You worked with us to make this meeting happen and asked for very little in return. As amateur radio operators, we can all take a lesson from your example. Amateur radio will need more people working together in order to keep our hobby/service growing. The survival and future of amateur radio is bigger and more important than any one person or club. You're a great teacher, leading by example. Thank you for visiting Rockford, and I hope you'll have the desire to do it again in the future.

Aw, shucks, Roger — I had a ball! Thanks for making it all happen ... Wayne. 73

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QRX

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committees in Washington, and Congress gave much time to proposed legislation designed to critically limit amateur radio activity.

In 1911, Albert Hyman chose the controversial Wireless Regulation Bill as the topic for his thesis at Harvard. His instructor insisted that a copy be sent to Senator David I. Walsh, a member of the committee hearing the bill. The senator was so impressed with the thesis that he asked Hyman to appear before the committee. Albert Hyman took the stand and described how the little station was built and almost cried when he told the crowded committee room that if the bill went through, they would have to close down the station because they could not afford the license fees and all the other requirements which the bill imposed on amateur stations.

Congressional debate began on the Wireless Regulation Bill and the little station "HAM" became the symbol for all the little amateur stations in the country crying to be saved from the menace and greed of the big commercial stations who didn't want them around. The bill finally got to the floor of Congress, and every speaker talked about the "... poor little station HAM." That's how it all started.

You will find the whole story in the *Congressional Record.* Nationwide publicity associated station "HAM" with amateur radio operators. From that day to this, and probably to the end of time in radio, an amateur is a "HAM."

From *Florida Skip* Magazine, 1959; thanks to the September 1998 issue of *AARC/OVER,* bulletin of the Austin (TX) Amateur Radio Club, Inc., Lloyd Crawford N5GDB, editor. 73

Already Have an Oscilloscope?

You won't find a cheaper add-on capacitor tester.

Rodney D. Iwan N4MCZ
8046 Windover Way
Titusville FL 32780

Here's a very simple circuit that will let you measure the values of unknown capacitors ranging in value from about .001 µF to about 3 µF. By modifying some of the circuit parameters and adapting the circuit layout, the ranges can be extended in either direction. The circuit is a simple square-wave oscillator borrowed right out of the manufacturer's handbook. The period of oscillation is primarily determined by the value of the test capacitor and the series resistance of the 56 k resistor and R1.

You don't have to worry about the accuracy of the timebase on your oscilloscope, nor of any of the resistor values. Calibration is ultra-simple: Just insert a capacitor of known value between the two test terminals and adjust R1 so that the period of the square wave viewed on the oscilloscope is 100 milliseconds per µF. For instance, a 0.1 µF capacitor should be set up to display a 10 millisecond period on the scope, a 1 µF capacitor should be set up to display 100 milliseconds, etc. If you don't have a known accurate unit for calibration, just take about 10 0.1 µF units, measure each of them and average the readings that you took. Take the capacitor that measured the nearest to the average reading and install it across the test terminals. Now adjust R1 until one period displays as 10 milliseconds on your scope. When an unknown capacitor is installed across the test terminals, its value (in µF) will be the displayed period in milliseconds divided by 100.

Note that you do get a square wave out with no capacitor across the test terminals. This is due to the stray capacitance in the circuit and does contribute some error to the measurement. When you measure very small capacitors, this error can be excessive. This is what limits the low end capability. By using good construction techniques, you might be able to minimize the error. Keeping any test leads short and widely separated does help. You can increase the usable upper range by decreasing the series value of R1 and the 56 k resistor. If you cut this value in half, the calibration factor will also be cut in half: that is, 5 milliseconds now correspond to 0.1 µF, but you can measure up to 5 or 6 µF capacitors then.

Be careful of polarity if you are measuring electrolytic or polarized capacitors—keep the negative lead on the ground test lead. Also, if you are measuring low-voltage electrolytics, keep the applied voltage to less than 150% of the rated voltage of the capacitor under test. Calibration is independent of the applied voltage. Additionally, a pleasant surprise (for me) was that shorted capacitors are readily found: The output to the scope goes high and stays high. 73

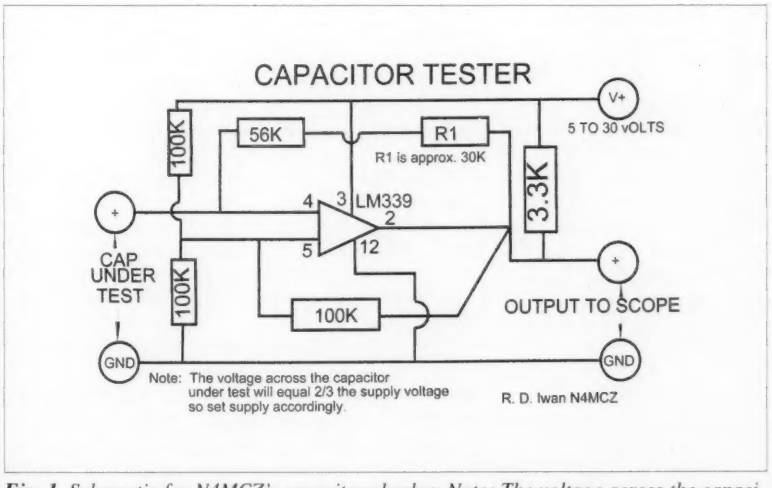

Fig. 1. *Schematic for N4MCZ's capacitor checker. Note: The voltage across the capacitor under test will equal 2/3 the supply voltage, so set supply accordingly.*

continued from page 5

was 15. By 16 I was busy making contacts on 40m CW. But it was the frontiers of amateur radio that attracted me. By 1939 I'd built a VHF walkie-talkie. This interest in radio naturally got me into a technical university, Rensselaer. And then, when World War II came along, into the Navy as an Electronic Technician. I volunteered for submarine duty, where I served from 1943–1945. Then they transferred me to the Submarine School in New London, CT to teach electronics.

After the war I went back to college, where I was the president of the radio club and founded WRPI, the campus radio station. Today that's the biggest student activity.

After college I worked as a radio engineer and DJ, then as chief cameraman at WPIX in New York and as a TV director at KBTV in Dallas and WXEL in Cleveland.

I got certificated and worked as a professional psychologist. I worked on a color organ on a Guggenheim Grant, and as the Secretary of the Music Research Institute, where I wrote my first book, *Music For Your Moods*.

But I was more interested in pioneering new ham modes, so when I heard about narrowband FM in 1946, I immediately got on the air with it. That's now the standard for VHF communication.

Oh, God!

There seems to be some genetic need to have a satisfying explanation for things we don't understand. This first led to people ascribing such things to various gods. Then along came the concept of there being just one God. As with any enterprise that offers money, prestige and power, a few people quickly stepped in to use these beliefs to their advantage. Piously stepped in, giving us one commercial religion after another.

The Catholic Church, most of the tenets of which considerably predate Jesus, knew a good thing when they saw it. I'm not sure how many Christian denominations there are, but there's sure no shortage. The Moslems are also split into several, perhaps many, denominations. I almost spelled that demon-ations. The Moslems are as busy killing each other's groups as are the Christians.

Arthur Horn, in his book, *Man's Extraterrestrial Origins*, suggests that ETs are not only genetically engineered man, which helps explain the lack of the famous missing link, but that the ETs set us up to be at war with each other by establishing different languages and religions for different groups. They apparently did this knowing that war is a powerful force for producing progress.

The ETs kept a low profile until we developed the technology to destroy our planet, after which they've been more and more visible. Even our government's best efforts haven't been able to hide their growing presence.

We are able to prove to ourselves the reality of God because we can so often see the results of our prayers. Since it is mainly the God-believers who resort to prayer, the power of wishing something to happen has not been given its proper recognition. Several books I've reviewed recently explain how anyone can use this wishing (prayer) power. There's the last chapter of the latest Dilbert book by Scott Adams, *The Dilbert Future*. Then there's Eugene Maurey's *The Power of Thought*. Both are reviewed in my book guide. Bevy Jaegers also has an excellent book on the subject that I really ought to include in my guide.

The books all explain how you can make things happen by wishing them, with or without any interference or help from God.

It's interesting that when you read the books by people who have interviewed people who have had near-death experiences, there is a general agreement that most people who die come back, reporting that they've gone to heaven and been visited by deceased relatives. Further, they all seem to return with a belief in God, but they tend not to have any further interest in any of the organized religions or churches.

Churches tend to try and control us through fear. God will punish us for our sins, and so on. Complete with a long list of sins and their severity. Control means power and prestige for the anointed, and money. Lots of money.

Scientists and religious leaders have been fighting for power for hundreds of years. They still are. Well, where money, power and prestige are concerned there is always going to be fighting. It's this war which has closed off whole areas of scientific research for scientists. Like the whole idea of "life" after death. You live, you die, period. And all this crapola about near-death experiences, psychics, past lives, reincarnation, telepathy, psychokinesis, precognition, angels, devils, *ouija* boards, seances, and so on is unscientific claptrap. Any scientist who even hints that he's going to venture into these areas is shunned, ridiculed, and made a pariah. He certainly isn't going to get any research grants, nor are his children or his children's children. Nor is he going to get anything published in a scientific journal. If he does discover anything, every effort will be made to make sure that as few people hear about it as possible.

Fortunately there are a few excellent books which help us better understand the link between science and religion. Between what we perceive with our eyes and God. There *are* well-researched books on near-death experiences, out-of-body experiences, reincarnation, past lives (even future lives!), telepathy, angels, and so on. There are even some excellent books on ETs and what they're up to.

The key to tying all this together with the scientific world has just recently been published. And "key" is the right word. This is *The Conscious Universe* by Dean Radin (1997), which I've reviewed recently and is, of course, reviewed in my book guide. I found the book quite by "accident," when I wandered into a bookstore I'd been avoiding for years. This came along at the time I needed it — at the time I was ready for it. Serendipity, as orchestrated by whom or what? I'm beginning to get some clues, thanks to Radin.

And thanks, too, to my grandmother, who, a couple years after her death, guided my mother to Mae Sewall's book, *Neither Dead Nor Sleeping*. The book, written by a world-famous women's rights leader 80 years ago, tells about her communications with her dead husband. Despite its having been out of print for almost 80 years I've reviewed it in my book guide. Now, serendipitously, Lydia Bronte has reprinted it for us. Lydia has a book reviewed in my guide, *The Mercury In Your Mouth*.

Radin leaves no wiggle room for scientists to ignore precognition, or even psychokinesis. He proves, in the language scientists can't ignore, math, that precognition is real. So what? Well, if you'll put on your thinking cap, as Uncle Don used to say, you'll begin to realize that our perception of time is just that, a perception. Once you can deal with that you'll begin to see that though we have no words for it, there is another … can we call it a universe? … out there. It isn't "life" after death. Heaven isn't a place. The hereafter isn't either here or after, at least to those who have "passed on." No wonder psychics have a problem communicating with the dear departed! We, on this "side," keep trying to understand the departed on our terms.

The more you read about serendipity and communications with "the other side," the more you understand that the things that are happening aren't always random.

The Sewall book helps explain why so many famous composers and writers have said that their music and words "come to them."

Thus we have the physical world of atoms and quarks, and we have the, er, *something else* which might be considered — like consciousness. And consciousness is able to manipulate matter. Radin shows mathematically that our consciousness can indeed manipulate matter. No wiggle room for skeptics.

People back from near-death experiences report that God is love. But I suspect that's for the lack of a more descriptive word. English may have a lot of words, but it is seriously impoverished when it comes to providing us with words to express feelings.

Heaven is, I suspect, where our consciousness is. How about the term soul? Every now and then some part of our consciousness incarnates, though I'm not sure why. But it's under our soul's watchful "eye," with soul-guided serendipity moving us along, and our soul occasionally appearing as an angel or dealing with us as a spirit guide.

We do seem to have good souls, bad souls, and in-between souls. I'll know more about that when I get over "there" and do some research. Will I be able to go into the future and use a 22nd century word processor?

But the relations between consciousness and matter are gradually being better understood. We're developing more and more ways of communicating with "the other side."

The commercial religious leaders know that this will threaten their power, prestige and revenues, so they're calling such investigations heresy, dealing with the devil, and so on.

The Bad News

An article in *Business Week* pointed out that for the first time the new generation is making less money than the last. 11% less, to be exact. From 1850 to 1950 waves of immigrants arrived, generally starting with low-paying, not very skilled, jobs. Their children were better educated and did better. This was the time when the Industrial Revolution was moving youngsters from the farms to the factories and small farms, which couldn't compete with large ones and were being replaced.

Then came the union movement, which tended to increase the wages for factory workers. But this bubble burst when the cost of international transportation made it possible for workers in less-developed countries to replace our factory workers. There no longer is such a thing as a highly-paid factory worker in America. Worse, the workers in foreign countries not only make lower wages, they now tend to be better educated than American workers.

There's a lot of hype about knowledgeable workers, but not much reality as to how they're turning knowledge into higher wages.

Wages depend on a company's revenues — and they, in turn, depend on making sales. Circulating money in a small community isn't going to increase sales and wages. You have to bring in money from outside the community. And that holds for a town, a state, and a country. So, if we want higher wages nationally we're going to have to sell products to other countries. To do that we have to make them first. And that means factories. So as our factories move out of the country, our overall wages are going to have to reflect this national loss of revenues. I hope that makes sense. And that's what's been happening.

Is there any solution to this downward spiral?

Well, we've been doing pretty well with high-tech products which have innovative new generations coming out before foreign factories can catch up, but that's not a marketing system to bet the country on.

Recycling PCs

There are tons of old PCs and printers out there available at scrap prices. Has anyone figured out anything to do with 'em yet?

The PCs are made up of a floppy drive, a monitor, power supply, keyboard, and the computer board. Most of the old PCs were taken out of service when just one of its elements failed, so by putting the working parts of two or three computers together you should be able to at least provide one working system, even though it may be using an older 386 or 486 chip.

Sure, these are slower, but they'll make very adequate and inexpensive word processors, and can be adapted for any number of applications.

A school or other nonprofit organization could attract an endless supply of these old machines from company storage rooms if the companies could get tax credits for their donations. That's a whole lot better place for them than the company dumpsters.

How difficult is it to update the old motherboards with newer chips? Or perhaps make a new board which could be patched in to update old systems? Hardware hackers should get their ingenuity working and get us some articles. There are millions of old PCs out there, so let's see what we can come up with.

Just look at what happened when the FCC forced taxicab companies to change to narrowband FM systems. We hams bought up their old rigs for

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repeaters were spaced 60 kHz apart. Of course it didn't take long before we had so many repeaters that we had to go to narrowband, spacing them 30 kHz apart. Then to our present 15 and 20 kHz. But it was those tons of old GE and Motorola taxi radio systems that triggered our revolution.

Don't just sit there, get your brain working.

Iconoclast

My dictionary defines an iconoclast as someone who attacks conventional or cherished beliefs and institutions as being false or harmful. Hey, that's *me!* I am definitely an iconoclast! And the more I look into things (that's called research), the more I find I'm disbelieving conventional institutions. And yes, these institutions and beliefs are harming us. And they're false. But we've all been hoodwinked (a.k.a. brainwashed, hypnotized) into believing them.

We are taught from the earliest childhood by our parents, our peers, neighbors, and the media to believe in the goodness of mom and apple pie. We're thoroughly inculcated with beliefs that are making us sick, robbing us of 20–30 years of life, and keeping us from making much money.

We believe in our school system. Oh, we know it has some problems. More money might fix them, right? And we believe in doctors. Sure, there are some quacks. We believe in our food suppliers who are providing us with "enriched" and "lite" products, but we're protected by the FDA. Most of us don't believe our government would lie to us about really important things. Of course there are a few conspiracy nuts who are forever trying to make trouble over the Fed, the Illuminati, the National Security Council, the New World Order, and so on. And we have a few atheists who (gulp!) don't believe in God.

Then there are the government coverups such as the UFOs and ETs, and the Amelia Earhart disappearance, which I knew personally about. Were the *Apollo* Moon visits all faked?

We're being bought off with entertainment to keep us too busy to figure things out. How much of your life is spent working, sleeping and being entertained?

Bioelectrimagnetics

Letters from happy builders of the Bioelectrifier keep coming in. It seems able to clean almost any kind of crud from the blood, making short work of the flu and so on.

Magnets, too, are working miracles in easing pain and promoting the rapid healing of wounds. Some veterinarians have been using magnets on animals after surgery and seeing the animals heal in a fraction of the usual time.

Being as able as you to ignore the obvious, it wasn't until a reader sent me a booklet on the subject that it dawned on me that if passing a microcurrent through the blood can do wonders, and using magnets likewise, why not combine the two?

Of course, if you are too busy wasting your life ragchewing about nothing on the repeater or 75m, then you won't be interested in experimenting with the combo to see what it can do. You can get a boost up in the field if you'll at least read a couple of books on what magnets can do. Yes, of course a couple of 'em are reviewed in my book guide. You'll want to know when to use the north pole and when the south. They do entirely different things to you (and to plants, too).

Let's see what you can come up with — and let me know.

Yes, More Y2K Stuff

The information industry's bible, *Computerworld*, is at long last beginning to sound the year 2000 computer problem warning. A recent issue had several articles on the subject, pointing out that finding and rewriting the old code is just one part of the problem. Then comes the testing, which can eat up as much time as the code rewriting. They need to test to make sure they've found *all* of the Y2K bugs, plus make sure they haven't introduced further bugs in the process. Then they need to develop contingency plans should some or even all of their systems stop working on Jan. 1, 2000.

Witness the recent massive mess at the opening of the new Hong Kong Chep Lak Kok airport, where untested computer systems delayed hundreds of planes from landing, thousands of travelers lost their luggage, the escalators froze, toilets overflowed, and perishable goods rotted in the broiling sun, running up damages in the hundreds of millions of dollars.

Just a week before there was a similar debacle with the opening of the new Kuala Lumpur airport at Sepang, where the 19 interconnected computer systems broke down, creating chaos. We had a taste of that when they opened the new Denver airport. Delayed planes, lost baggage, and so on. That's when Continental Airlines gave up and moved their major hub operation out of Denver.

These little snafus give us an idea of the mess that the Y2K could generate — except that it looks as if it could well be worldwide chaos in every industry and with every government.

Even More Y2K

A few weeks ago Senator Robert Bennett of Utah, the chairman of the Senate Special Committee on Year 2000 Technology Problem, gave the keynote talk at a Y2K conference. He went through a long list of the problems facing various industries in coping with the problem, pointing out that even if our major corporations manage in some way to get all of these computer systems Y2K compliant, they still face the very real potential of not being able to get through to their foreign offices and subsidiaries. The telephone systems in South America, Asia and much of Eastern Europe are very likely to be down, making it impossible to send or receive money transfers, handle routine business, or maintain a flow of products. The banks in these countries could also suffer catastrophic failures.

How serious is the Y2K problem? Bennett is right in the middle of it, and he was very frank in saying that he doesn't know whether it's going to turn out to be "just a serious bump in the road or trigger a major worldwide recession with absolutely devastating economic consequences."

January first 2000 is coming and not even an act of Congress can stop it.

Bennett asked, Will the railroads keep running? They're all totally computerized. If they stop, that will stop the coal from being delivered to power generating stations, and without power it doesn't matter whether our computers are Y2K compliant or not. All it might take to grind a railroad system to a halt would be some embedded chip in the system that suddenly thinks it's the year 1900.

The FDA Again

The government SWAT teams are at it again. Wait'll you get a load of this one! This happened in the Dallas area.

Stevia is a safe, natural herb that is hundreds of times sweeter than sugar and has no calories. It's been used for years around the world, and particularly in Japan. A small company in Arlington, Texas, has been publishing books about stevia, including cookbooks, and selling stevia.

The FDA came in and confiscated their stevia and mandated that their books be burned. The arrival of a TV news camera stopped the burning temporarily. It took the threat of a legal suit against the FDA in Washington to back them down.

So what's this all about? It's about protecting the sales of Aspartame®, which is owned by Monsanto. Aspartame is anything but safe and has been linked to thousands of adverse reactions — vision problems, headaches, and seizures. There are several books citing the problems Aspartame has caused people.

The Hep-C Generation

Hepatitis-C is deadly, there's no known effective treatment,

and four times as many Americans have it as AIDS. So how many deaths will it take to get our medical industry to at least test the Bioelectrifier against this new viral blood-system foe?

According to the doctors at the Albert Einstein College of Medicine, passing a micro-current through the blood prevents any virus, microbe, fungus, yeast, or parasite from either replicating or attaching to white cells, thereby killing it. They even got a patent on doing this, but from then on a blanket of secrecy has cloaked the whole affair. Nothing has appeared in the medical journals.

When Dr. Beck proposed applying the micro-current to the blood stream without removing the blood from the body, the prospective cost for the procedure dropped from tens of thousands of dollars to pennies, a nightmare that the medical industry, with the help of the FDA, NIH, WHO, and other bureaus with thousands of employees diligently working toward their retirement pensions, has been fighting to prevent.

I've run two articles so far on building simple Bioelectrifiers. Hardly a day goes by that I don't get a letter from someone who claims that this device has helped them, with simple things like toothaches and headaches to cancer, lupus, Lyme disease, and AIDS. But this is all anecdotal, and doesn't prove anything. What is needed are some carefully done double-blind medical tests, done by a recognized research hospital.

My thanks to Bill Rose KLØNW for sending me the clipping on hep-C — which featured a photo of Janet Crenshaw at her ham station.

Web Pages

It's about time that some ham publication started providing a list of the Web sites of interest to hams. So, what are you waiting for? Get busy and dump 'em on me via snail- or E-mail [design73@aol.com]. Oh yes, one more thing: How about giving the Web sites a rating as to how interesting you've found 'em? Maybe we can work up a list of the top 10 ham Web sites if we get enough votes to make it valid. You might also comment on how friendly the sites are. Some, obviously done by programmers showing off, take so long to load that the irritation factor outdoes the interest of the site information. "Keep it simple" should be the guiding star.

Okay, I know that amateur radio isn't everything, so how about a list of the five most interesting Web sites of any kind that you've found? With a zillion Web pages out there, we need all the guidance we can get.

Look, the Internet is here to stay (at least until Y2K hits), so let's take advantage of its benefits and integrate it into amateur radio. With the Internet being used for el cheapo phone calls and real audio broadcasting, how soon will it be before we're seeing some repeater-like systems being developed? So get busy and do it, then let's see some articles on interfacing the Internet. Maybe we could treat it like a new ham band with international round tables going on over different channels. Or how about interfacing it with repeaters so I could make some contacts over the Hong Kong repeater, for instance? Or the Swaziland repeater. I've used those when I was visiting, so I'd love to get back in touch with the chaps I met without having to run a kilowatt and a big beam to do it.

I know they're doing video on the Internet, but how about slow-scan?

White House Amnesia

We've been under a steady media smear barrage aimed at special prosecutor Kenneth Starr. It's almost time for the louder of the media mouths to take a look at the evidence. Starr's investigation turned up enough evidence to get more than 20 felony convictions — from a jury made up of the people in Arkansas who elected Clinton governor. Twice. One of those convicted was Susan McDougal, who still refuses to say whether Clinton was in on the fraudulent deal that got her convicted. By the way, Susan is also under indictment for embezzlement in California.

Then there was the felony conviction of Webster Hubble, the hundreds of thousands of dollars that suddenly appeared out of nowhere, and his memory failure when it came time to provide the evidence he'd promised in exchange for a reduced sentence.

How about Vernon Jordan and his amazing good deeds for Hubble and Monica Lewinsky when they became possible witnesses against Clinton? Monica was offered a $90,000 job, despite her inexperience.

Then there was the remarkably serendipitous death of White House counsel Vincent Foster on the day that the first Whitewater subpoena (that led to all those felony convictions) was issued. We also know positively that White House aides spent hours ransacking Foster's office before law enforcement officers arrived to investigate, and this despite their being asked specifically to leave everything alone. Phone records show that those ransacking Foster's office made many phone calls to Hillary Clinton that night, ending after midnight. When called to testify under oath about these calls, none of the aides could remember anything that was said. Mass amnesia had set in.

Amnesia also set in when the White House officials were asked who had hired the White House aide and former bouncer who illegally had the confidential files of hundreds of Republicans in his hands. They also had no memory of why he had the files or what he was doing with them.

Then there are the people from foreign countries who gave huge donations to the Clinton campaign and then either took the Fifth Amendment or quickly got out of the country when questions were raised. The Chinese nuclear missiles that now have American technology to make them more accurate resulted from Clinton's overruling our military experts. The Chinese government has recently boasted that their missiles can now reach our cities. They sure got their money's worth for their illegal donations. Maybe Bill will apologize if the Chinese nuke a few of our cities.

Kenneth Starr has his work cut out for him, with the White House covering things up as fast as they can in every direction he turns, and all the while doing their best to smear him.

Please, please, try to remember my first step in solving many of these problems: Never Re-elect Anyone. NRA.

If you accuse me of stealing a lot of the above information from a Thomas Sowell column, I have no memory of it.

Tubes

You remember tubes, right? I was going through some boxes of books out in the barn and came across my old RCA tube manuals. What a trip through memory lane. I don't think there are any tube manuals these days, but you probably can get answers to your tube questions at [www.svetlana.com].

Back in 1965, when I saw the handwriting on the wall, I organized a hamfest in Peterborough. I rented the local armory and a bunch of tables from churches to lay out all my equipment and parts. We had one heck of an auction, with big boxes of tubes going for a dollar, and all kinds of great surplus stuff going for pennies. I was mainly interested in finding good homes for my treasures.

When I moved from Brooklyn to Peterborough in 1962 it took five truckloads to get it all up here. I'd not only totally filled the cellar of my Brooklyn home, but also four rented neighbors' garages. One truck was so heavily loaded with my equipment that Larry WA2INM, who helped with the move, had to back the truck up some hills to get it here. And when he pulled into the Peterborough gas station and one tire blew out, normal truck jacks just sank into the asphalt so they had to get a special jack. But I wrote about that in 1962 so you

Continued on page 62

PROPAGATION

Jim Gray W1XU/7
210 E Chateau Circle
Payson AZ 85541
[jimpeg@netzone.com]

Very disturbed geophysical conditions (Poor to Very Poor) are expected from November 1–11, with poorest propagation expected on November 6, 7, and 8 (see calendar).

During this period, you can also expect violent storms and other geophysical effects, as well as ionospheric upsets, on Earth.

Propagation conditions between November 12 and 16, and again between 17 and 21, are expected to be variable, ranging from Poor to Fair. You can expect excellent DX propagation during the period between November 21 and the end of the month, with a slight fade to Fair on the last two days. December will probably start off with Poor propagation.

10–12 meters

Fairly good transequatorial DX should occur during local afternoons. Also, some F2-layer openings on east-west paths to Africa and the South Pacific may be possible in the morning. Short skip out to 2,000 miles or so ought to be available in the afternoon.

15–17 meters

Reasonably good DX to all areas of the world, especially to Africa, South America and the South Pacific during daylight hours and peaking in the afternoon. Short-skip openings to distances greater than 1,000 miles should be common.

20 meters

Expect openings to all areas of the world from morning to evening (see band-time-country chart), peaking locally an hour or so after sunrise and again during the afternoon. Short skip beyond 750 miles should be good during the day.

30–40 meters

Fairly good worldwide DX openings may be expected from early evening through sunrise; short skip from 100 to 1,000 miles during the day, and beyond during darkness hours. As always, QRN can be a problem, but should be abating this month.

80–160 meters

On 80 meters, you may find fairly good DX openings to the southern hemisphere during hours of darkness and sunrise; short skip to about 350 miles during the day, and out to between 500 and 2,000 miles at night. On 160 meters, look for DX during the hours of darkness and just before dawn. Short skip should be available from 1,500 to 2,300 miles at night.

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch. Smart operators don't try to bust pileups unless they have super antennas and kilowatt rigs. Be smart and wily ... like a fox ... and make your play before the pileup starts. Listen, listen, and listen. 73, W1XU/7. 73

November 1998

SUN	MON	TUE	WED	THU	FRI	SAT
1 P	2 P	3 P	4 P	5 P	6 P-VP	7 VP
8 VP	9 VP-P	10 P	11 P-F	12 F	13 F-P	14 P
15 P	16 P-F	17 F	18 F-G	19 G-F	20 F	21 F-G
22 G	23 G	24 G	25 G	26 G	27 G	28 G
29 G-F	30 F					

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20					20	20				15
ARGENTINA	20	20	40	40						10	10	15
AUSTRALIA	15		20			40	20	20				15
CANAL ZONE	15	20	40	40	40		20	20	20	10	10	15
ENGLAND	40	40	40	40			20	15	10	10	20	20
HAWAII	15	20	20	40	40	40	20	20			10	10/15
INDIA							20	20				
JAPAN	15	20					20	20				15
MEXICO	15	20	40	40	40		20	20	20	10	10	15
PHILIPPINES							20	20				
PUERTO RICO	15	20	40	40	40		20	20	20	10	10	15
RUSSIA (C.I.S.)	40	40						15	15	20		
SOUTH AFRICA	20								15	15	10	20
WEST COAST	40	80						20	20	20	15	40

CENTRAL UNITED STATES TO:

ALASKA	15											15
ARGENTINA	15	20	20	40	40						10	15
AUSTRALIA	15	20	20	20		40	80					15
CANAL ZONE	15	20	20	40	40			15	15	10	10	15
ENGLAND		40/80	40/80			15/20	15	15	20	20	20	
HAWAII	15	20	20	40	40	40	80	20			10	15
INDIA								20				
JAPAN	15											15
MEXICO	15	20	20	40	40			15	15	10	10	15
PHILIPPINES	15	20						20				
PUERTO RICO	15	20	20	40	40			15	15	10	10	15
RUSSIA (C.I.S.)								20	15	20		
SOUTH AFRICA	20									15	15	20

WESTERN UNITED STATES TO:

ALASKA	10/15	15	15	20	20	20	40	40				15
ARGENTINA	10/15	20	20	40							15	10/15
AUSTRALIA	10	15	15	20	20	40	40	40	20	20	15/20	15
CANAL ZONE	20	20	40/20	40/20	40			20	15	15	10	10
ENGLAND										15/20	15-20	
HAWAII	10	15	20/15	40	40	40	40	40		20	20	20
INDIA	15/20	15/20							20			
JAPAN	10/15	15	15	20	20	20	40	40				15
MEXICO	20	20	40/20	40/20	40			20	15	15	10	10
PHILIPPINES	15/20	15/20		20		40	40		20	20		15
PUERTO RICO	20	20	40/20	40/20	40			20	15	15	10	10
RUSSIA (C.I.S.)									20			
SOUTH AFRICA	20	20								15	15	20/15
EAST COAST	40	80						20	20	20	15	40

NEVER SAY DIE

continued from page 61

probably don't want to read about all that again.

I sort of hated to see the big bottles go. You know, like the 833As. I still have a couple of 10 kW tuning capacitors out in the barn. No one wanted 'em. *Huge* suckers.

Well, you see, I spent many years at the workbench building stuff and modifying surplus gear. When I needed a capacitor I'd go to Radio Row in Manhattan and buy a dozen or two, just in case. So I ended up with parts cabinets full of switches, tube sockets, connectors, jacks, potentiometers, meters, all kinds of

Continued on page 64

(TEAR HERE)
GIVE ME A 73 SUB RENEWAL FOR CHRISTMAS!
(LEAVE ON KITCHEN COUNTER)

Radio Bookshop

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (Z)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

1997 Editorials: 240 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three $5 volumes. $15 (O)

1998 Jan-Aug Editorials: 188 pages in two $5 volumes. Bringing you up to date. $10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. $5 (Q)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (V)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months. $5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

.....Wayne

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Yes! Put me down for a year of *73* for only $25 (a steal). Canada US$32. Foreign US$44 by sea, US$67 by air. Whew!

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: ***73 Magazine*, Barter 'n' Buy, 70 Route 202N, Peterborough NH 03458** and get set for the phone calls. The deadline for the February 1999 classified ad section is December 10, 1998.

SELL QRP++ (UPGRADED), MANUAL, POWER CABLE, HAND AND DESK MIKES. EXCELLENT RIG. $400 MONEY ORDER. SHIPPING INCLUDED. **W4LJD**, BOX 30, SALINAS PR 00751-0030. BNB340

BIOELECTRIFIER™ 5 Hz micro current supply for plant and animal research. Semi-Kit $38.00. Assembled complete with batteries and silver electrodes $89.50. Add $2.50 postage. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB343

RF TRANSISTORS TUBES 2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, 6KG6A, etc. **WESTGATE**, 1 (800) 213-4563. BNB6000

Cash for Collins: Buy any Collins Equipment. **Leo KJ6HI.** Tel./FAX (310) 670-6969. [radioleo@earthlink.net] BNB425

MAHLON LOOMIS, INVENTOR OF RADIO, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. BNB420

METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS Johan N3RF. Send $1.00 & SASE. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA. BNB421

WWII MILITARY TELEVISION WANTED: Army/Navy SCR, ATJ, ATK, ARK, ARJ, CEK, CRV. Receivers, cameras, monitor, transmitters, dynamotors. **Maurice Schechter**, 590 Willis Ave., Williston Park NY 11596, P/F (516) 294-4416. BNB69

QSL CARDS. Basic Styles; Black and White and Color Picture Cards; Custom Printed. Send 2 stamps for samples and literature. RAUM'S, 8617 Orchard Rd., Coopersburg PA 18036. Phone or FAX (215) 679-7238. BNB519

WANTED: High capacity 12 volt solar panels for repeater. [**kk4ww@fairs.org**] or (540) 763-2321. BNB2630

COLLOIDAL SILVER GENERATOR! Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, $74.50. Same, but DC powered, $54.50. Add $2.50 shipping. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB342

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone:** (616) 925-5899, 8–4 ET. BNB964

WANTED: NYE VIKING STATION MONITOR RFM-003, RFM-005. Paying $600. Randy Ballard N5WV, **(903) 687-3002**; [TMT@Prysm.net]. BNB5001

ASTRON power supply, brand-new w/warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249, **AVT**. Call for other models. **(626) 286-0118.** BNB411

Ham Help

We are happy to provide Ham Help free on a space-available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double-spaced, on a full 8-1/2 x 11-inch sheet of paper. Use upper- and lowercase letters where appropriate. Also, print numbers carefully. A 1, for example, can be misread as the letters I, i, l, or even the number 7. Specifically mention that your message is for the Ham Help column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

Searchin' every whichaway

Desperately need service and technical manuals for Sideband Engineers (SBE) Transceiver model SB-36. Thanks for any help.

Al Cikas KA9GDL
412 Radford Drive
Sherman IL 62684

Gonna find it

Needed: Owner's manual for product labeled Unique Wire Tuner, made by Unique Products Co. (UPC), 1003 S. Fircroft, West Covina CA, approximately 1976. This company also made a product called the Identiminder. Any help much appreciated.

Dick Burke KA1ZQR
348 N. Main St.
Stonington CT 06378

Gonna keep searchin'

I am looking for an audio mod for the Radio Shack DX-394. Mine seems to exhibit a lot of distortion. Any info on audio improvements? All responses will be appreciated.

Rick Aiello
2945 Presbyterian Road
Mt. Morris NY 14510

Never say die

continued from page 62

resistors and capacitors. I had so much stuff I could build almost anything without having to get more parts. A Williamson amplifier? No problem. A RTTY control unit? Easy.

Then came transistors and printed circuit boards instead of steel chassis and 19-inch panels. Followed by ICs and soldering pencils instead of 300-watt irons. By 1965 I saw the handwriting on the wall and got rid of just about everything in one massive auction. The ARRL had their national convention in Seattle the same weekend and I had more hams here than they did! I don't think anyone went home empty-handed.

Getting rid of all that stuff cleared out my barn, which I eventually converted into offices for my computer magazines. I've never really missed all that stuff. 73

JRC

JST-245

160-10 Meters PLUS 6 Meter Transceiver

Fifteen reasons why your next HF transceiver should be a JST-245. . .

1 All-Mode Operation (SSB,CW,AM,AFSK,FM) on all HF amateur bands and 6 meters. JST-145, same as JST-245 but without 6 meters and built-in antenna tuner.

★ JST-145 COMING SOON ★

2 MOSFET POWER AMPLIFIER • Final PA utilizes RF MOSFETs to achieve low distortion and high durability. Rated output is 10 to 150 watts on all bands including 6 meters.

3 AUTOMATIC ANTENNA TUNER • Auto tuner included as standard equipment. Tuner settings are automatically stored in memory for fast QSY.

4 MULTIPLE ANTENNA SELECTION • Three antenna connections are user selectable from front panel. Antenna selection can be stored in memory.

5 GENERAL COVERAGE RECEIVER • 100 kHz-30 MHz, plus 48-54 MHz receiver. Electronically tuned front-end filtering, quad-FET mixer and quadruple conversion system (triple conversion for FM) results in excellent dynamic range (>100dB) and 3rd order ICP of +20dBm.

6 IF BANDWIDTH FLEXIBILITY • Standard 2.4 kHz filter can be narrowed continuously to 800 Hz with variable Bandwidth Control (BWC). Narrow SSB and CW filters for 2nd and 3rd IF optional.

7 QRM SUPPRESSION • Other interference rejection features include Passband Shift (PBS), dual noise blanker, 3-step RF attenuation, IF notch filter, selectable AGC and all-mode squelch.

8 NOTCH TRACKING • Once tuned, the IF notch filter will track the offending heterodyne (±10 Khz) if the VFO frequency is changed.

9 DDS PHASE LOCK LOOP SYSTEM • A single-crystal Direct Digital Synthesis system is utilized for very low phase noise.

10 CW FEATURES • Full break-in operation, variable CW pitch. built in electronic keyer up to 60 wpm.

11 DUAL VFOs • Two separate VFOs for split-frequency operation. Memory registers store most recent VFO frequency, mode, bandwidth and other important parameters for each band.

12 200 MEMORIES • Memory capacity of 200 channels, each of which store frequency, mode, AGC and bandwidth.

13 COMPUTER INTERFACE • Built-in RS-232C interface for advanced computer applications.

14 ERGONOMIC LAYOUT • Front panel features easy to read color LCD display and thoughtful placement of controls for ease of operation.

15 HEAVY-DUTY POWER SUPPLY • Built-in switching power supply with "silent" cooling system designed for continuous transmission at maximim output.

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Features:

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- IF Stage 16/24 Bit Digital Signal Processing (DSP)
- II DSP Bandpass Filter Widths from 100 Hz to 3.5 kHz (6 kHz in AM Mode)
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- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

The Kachina 505DSP Computer Controlled HF Transceiver After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

Why Use Knobs if You Have Windows? The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

16/24 Bit DSP/DDS Performance In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDS performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add *lots* of punch to your transmitted signal, without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

Seeing is Believing American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at http://www.kachina-az.com for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

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